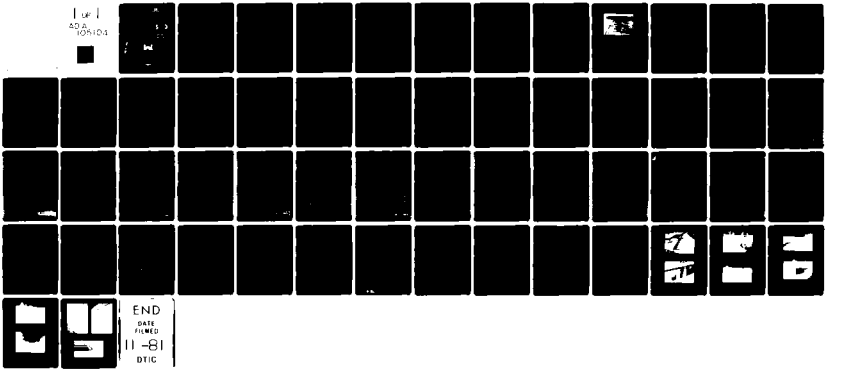
AD-A105 104 ANDERSON ENGINEERING INC SPRINGFIELD MO F/G 13/13
NATIONAL DAM SAFETY PROGRAM. LITTLE DIXIE DAM (MO 10888), MISSO--ETC(U)
DEC 78 J M HEALY, S L BRADY DACW43-78-C-0166
UNCLASSIFIED NL



END
DATE FILMED
11-81
DTIC

LEVEL II

1

MISSOURI - KANSAS CITY BASIN

LITTLE DIXIE DAM

CALLAWAY COUNTY, MISSOURI

MO 10888

PHASE I INSPECTION REPORT
NATIONAL DAM SAFETY PROGRAM.

Little Dixie Dam (MO 10888),
Missouri - Kansas City Basin, Callaway County,
Missouri. Phase I Inspection Report.

(9) Final rept.

DACW43-78-C-0166

PREPARED BY: U. S. ARMY ENGINEER DISTRICT, ST. LOUIS

FOR: STATE OF MISSOURI

(10) John M. /Healy Steven L. /Brady

(12) 256

(11) DEC 78

35

UNCLASSIFIED

SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

REPORT DOCUMENTATION PAGE		READ INSTRUCTIONS BEFORE COMPLETING FORM
1. REPORT NUMBER	2. GOVT ACCESSION NO. AD-A105 104	3. RECIPIENT'S CATALOG NUMBER
4. TITLE (and Subtitle) Phase I Dam Inspection Report National Dam Safety Program Little Dixie Dam (MO 10888) Callaway County, Missouri		5. TYPE OF REPORT & PERIOD COVERED Final Report 6. PERFORMING ORG. REPORT NUMBER
7. AUTHOR(s) Anderson Engineering, Inc.		8. CONTRACT OR GRANT NUMBER(s) DACW43-78-C-0166
9. PERFORMING ORGANIZATION NAME AND ADDRESS U.S. Army Engineer District, St. Louis Dam Inventory and Inspection Section, LMSED-PD 210 Tucker Blvd., North, St. Louis, Mo. 63101		10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS
11. CONTROLLING OFFICE NAME AND ADDRESS U.S. Army Engineer District, St. Louis Dam Inventory and Inspection Section, LMSED-PD 210 Tucker Blvd., North, St. Louis, Mo. 63101		12. REPORT DATE December 1978 13. NUMBER OF PAGES Approximately 45
14. MONITORING AGENCY NAME & ADDRESS(if different from Controlling Office)		15. SECURITY CLASS. (of this report) UNCLASSIFIED 15a. DECLASSIFICATION/DOWNGRADING SCHEDULE

16. DISTRIBUTION STATEMENT (of this Report)

Approved for release; distribution unlimited.

17. DISTRIBUTION STATEMENT (of the abstract entered in Block 20, if different from Report)

18. SUPPLEMENTARY NOTES

19. KEY WORDS (Continue on reverse side if necessary and identify by block number)

Dam Safety, Lake, Dam Inspection, Private Dams

20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

This report was prepared under the National Program of Inspection of Non-Federal Dams. This report assesses the general condition of the dam with respect to safety, based on available data and on visual inspection, to determine if the dam poses hazards to human life or property.

DD FORM 1 JAN 73 1473 EDITION OF 1 NOV 65 IS OBSOLETE

UNCLASSIFIED

SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

DEPARTMENT OF THE ARMY
ST. LOUIS DISTRICT, CORPS OF ENGINEERS
210 NORTH 12TH STREET
ST. LOUIS, MISSOURI 63101

IN REPLY REFER TO

SUBJECT: Little Dixie Dam Phase I Inspection Report

This report presents the results of field inspection and evaluation of the Little Dixie Dam:

It was prepared under the National Program of Inspection of Non-Federal Dams.

This dam has been classified as unsafe, non-emergency by the St. Louis District as a result of the application of the following criteria:

1) Spillway will not pass 50 percent of the Probable Maximum Flood
2) Overtopping could result in dam failure
3) Dam failure significantly increases the hazard to loss of life downstream

SUBMITTED BY: SIGNED
Chief, Engineering Division — 12 MAR 1979 Date

APPROVED BY:
Colonel, CE, District Engineer — 12 MAR 1979 Date

LITTLE DIXIE DAM

CALLAWAY COUNTY, MISSOURI

MISSOURI INVENTORY NO. 10888

PHASE I INSPECTION REPORT
NATIONAL DAM SAFETY PROGRAM

Prepared By

Anderson Engineering, Inc., Springfield, Missouri
Hanson Engineers, Inc., Springfield, Illinois

For

The Governor of Missouri

December, 1978

PHASE I REPORT
NATIONAL DAM SAFETY PROGRAM

Name of Dam: Little Dixie Dam
State Located: Missouri
County Located: Callaway County
Stream: Owl Creek
Date of Inspection: 23 August 1978

Little Dixie Dam was inspected by an interdisciplinary team of engineers from Anderson Engineering, Inc. of Springfield, Missouri and Hanson Engineers, Inc. of Springfield, Illinois. The purpose of the inspection was to make an assessment of the general condition of the dam with respect to safety, based upon available data and visual inspection, in order to determine if the dam poses hazards to human life or property.

The guidelines used in the assessment were furnished by the Department of the Army, Office of the Chief of Engineers, and have been developed with the help of several Federal and State agencies, professional engineering organizations, and private engineers. Based on these guidelines, this dam has been classified by the St. Louis District Corps of Engineers as an intermediate size dam with a high downstream hazard potential. Their estimate of the damage zone extends 15 miles downstream of the dam. Within the first mile of the damage zone are eleven houses, three mobile homes, one church, one commercial building, one fish hatchery with 22 ponds and a service building, one state highway crossing and a farmhouse with associated farm buildings.

Our inspection and evaluation indicates that the combined spillways do not meet the criteria set forth in the guidelines for a dam having the above size and hazard potential. The combined spillways will pass 36 percent of the Probable Maximum Flood without overtopping. The probable maximum flood is defined as the flood discharge that may be expected from the most severe combination of critical meteorologic and hydrologic conditions that are reasonably possible in the region. The guidelines require that a dam of intermediate size with a high downstream hazard potential pass 100 percent of the PMF. The combined spillways will pass the 100-year flood, without overtopping.

The embankment and appurtenances inspected appear to be in good condition. Minor deficiencies, including erosion, tree growth and concrete deterioration, were noted and should be corrected by the owner. Another deficiency was

the lack of seepage and stability analyses. A detailed report is attached to be submitted to the owners and to the Governor of Missouri.

John M. Healy, P.E.
Hanson Engineers, Inc.

Steven L. Brady, P.E.
Anderson Engineering, Inc.

PHASE 1 INSPECTION REPORT
NATIONAL DAM SAFETY PROGRAM
LITTLE DIXIE DAM - ID NO. 10888

TABLE OF CONTENTS

APPENDICES

Aerial View of Lake and Dam

SECTION 1 - PROJECT INFORMATION

1.1 GENERAL:

A. Authority:

The National Dam Inspection Act, Public Law 92-367, authorized the Secretary of the Army, through the Corps of Engineers, to initiate a program of safety inspection of dams throughout the United States. Pursuant to the above, the St. Louis District, Corps of Engineers, District Engineer directed that a safety inspection be made of Little Dixie Dam in Callaway County, Missouri.

B. Purpose of Inspection:

The purpose of the inspection was to make an assessment of the general condition of the dam with respect to safety, based upon available data and a visual inspection in order to determine if the dam poses hazards to human life or property.

C. Evaluation Criteria:

Criteria used to evaluate the dam were furnished by the Department of the Army, Office of the Chief of Engineers, in "Recommended Guidelines For Safety Inspection of Dams, Appendix D". These guidelines were developed with the help of several federal agencies and many state agencies, professional engineering organizations, and private engineers.

1.2 DESCRIPTION OF PROJECT:

A. Description of Dam and Appurtenances:

Little Dixie Dam is an earth fill structure approximately 40.5 ft high and 1600 ft long at the crest. The appurtenant works consist of a broad-crested weir concrete chute primary spillway, which is located near the west abutment of the dam, and a grass-covered emergency spillway, which is located at the east abutment of the dam. A 24 in. diameter steel pipe is provided near the center of the dam to drain the lake. In addition, a 12 in. diameter steel pipe is provided near the east end of the dam to provide water for the fish rearing pools immediately downstream of the dam. Sheet 2 of Appendix A shows a plan of the embankment and spillways and a profile of the embankment.

B. Location:

The dam is located in the northwest part of Callaway County, Missouri on Owl Creek. The dam and lake are within the Millersburg, Missouri and Millersburg NE, Missouri

7 1/2 minute quadrangle sheets, (SE 1/4 Section 26, Twp. 48 N, R 11 W-latitude 39° 54.3'; longitude 92° 7.4'). Sheet 1 of Appendix A shows the general vicinity and location of the dam.

C. Size Classification:

With an embankment height of 40.5 ft and a maximum storage capacity of approximately 4239 acre-ft, the dam is in the intermediate size category.

D. Hazard Classification:

The St. Louis District, Corps of Engineers has classified this dam as a high hazard dam. Their estimate of the damage zone extends 15 miles downstream of the dam. Within the first mile of the damage zone are eleven houses, three mobile homes, one church, one commercial building, one fish hatchery with 22 ponds and a service building, one state highway crossing and a farmhouse with associated farm buildings.

E. Ownership:

The dam was designed by the Missouri Conservation Commission and is owned by the Missouri Department of Conservation Their address is 2901 North Ten Mile Drive, Jefferson City, Missouri 65101.

F. Purpose of Dam:

The dam and lake are a part of the Little Dixie State Wildlife Management Area.

The purpose of the dam is to provide wildlife habitat as well as recreation; some flood protection is also provided.

G. Design and Construction History:

The dam was designed by the Missouri Conservation Commission and completed in 1958. Plans for construction are available and have been used to prepare this report. No significant problems in regards to seepage through or stability of the embankment are reported to have occurred since the dam was built. According to Missouri Department of Conservation personnel, the water intake feed line structure and pipes were replaced in 1975.

H. Normal Operating Procedure:

Normal flows will be passed by an uncontrolled concrete chute primary spillway, whereas a grassed emergency spillway would come into operation for major floods. Records from a United States Geological Survey (U.S.G.S.) gaging station

in the right bank 500 ft upstream of the dam indicate that the high pool elevation was 832.33 (1.33 ft above the primary spillway crest) on March 6, 1973. The gage was established in 1964. No records are available before installation of the gaging station.

1.3 PERTINENT DATA:

Pertinent data about the dam, appurtenant works, and reservoir are presented in the following paragraphs. Sheet 2 of Appendix A is a plan of the embankment and spillways with a profile of the dam. Sheet 3 shows several cross sections of the dam. Sheet 4 presents additional cross sections of the dam and details of the rearing pool feed line. Sheet 5 presents a plan and profile of the lake drain. Details of the intake structure are shown on Sheet 6. Presented on Sheet 7 are a plan and elevation of the primary spillway. Sheet 8 shows the entrance layout of the primary spillway.

A. Drainage Area:

The drainage area for this dam, as obtained from the Millersburg, Missouri and Millersburg NE, Missouri 7 1/2 minute quad sheets, is equal to approximately 2314 acres.

B. Elevations (Feet Above M.S.L.):

(1) Top of dam (measured): West End 837.6; Center 836.3; East End 837.2.
Top of Dam (Design Plans): 837.5.

(2) Principal Spillway Crest: Design Plans 831.0; Measured 831.0.

(3) Emergency Spillway Crest: Design Plans 833.5; Measured 833.4.

(4) Lake Drain Outlet Pipe Invert: Design Plans 797.0; Measured 796.9.

(5) Pool on Date of Inspection: Measured 830.7.

(6) Recorded High Water Mark (March 6, 1973): Measured 832.3.

(7) Streambed at Centerline of Dam: Design Plans 797.0.

(8) Maximum Tailwater: Unknown.

C. Discharge at Dam Site:

(1) All discharge at the dam site is through uncontrolled spillways.

(2) Estimated Discharge Capacity at Top of Dam (El. 836.3): 2810 cfs.

(3) Estimated Maximum Discharge (High Water Mark - El. 832.3): 180 cfs.

D. Reservoir Surface Areas:

(1) At Principal Spillway Crest: 200 acres.

(2) At Top of Dam: 268 acres.

E. Storage Capacities:

(1) At Principal Spillway Crest: 3075 acre-ft.

(2) At Top of Dam (El. 836.3): 4239 acre-ft.

F. Reservoir Lengths:

(1) At Principal Spillway Crest (Estimated from Topographic Map): 6900 ft.

(2) At Top of Dam (Estimated from Topographic Map): 8400 ft.

G. Dam:

(1) Type: Rolled earth.

(2) Length at Crest: 1600 ft.

(3) Height: 40.5 ft.

(4) Top Width: 14 ft.

(5) Side Slopes: 2.5H:1V downstream; 3.0H:1V upstream (with 10 ft wide berm at elevation 825).

(6) Zoning: Homogeneous.

(7) Cutoff: Shallow core trench (10 ft wide at bottom; 1H:1V side slopes; 17 ft maximum depth from plans).

H. Principal Spillway:

(1) Location: West end of dam--Station 2+50.

(2) Type: Broad-crested weir concrete chute.

I. Emergency Spillway:

(1) Location: East abutment.

(2) Type: Grass-covered earth with 100 ft crest length and 3H:1V side slopes.

SECTION 2 - ENGINEERING DATA

2.1 GENERAL:

Available design computations and reports for Little Dixie Dam include hydrologic and hydraulic design computations and a Missouri Department of Conservation Memorandum which contains a study of various design combinations for replacement of the water intake structure for the rearing ponds. No documentations of construction inspection records have been obtained. There are no documented maintenance and operation data to our knowledge.

A United States Geological Survey (U.S.G.S.) Gaging Station was established in August 1964 at a location 500 ft upstream from Little Dixie Dam. Information on this Gaging Station was provided by U.S.G.S. and is presented on Sheet 1 of Appendix B.

2.2 DESIGN:

A. Surveys:

No information regarding pre-construction surveys was able to be obtained. However the Gaging Station information on Sheet 1 of Appendix B contains descriptions of benchmarks established at the site. The water level of the lake was used as a temporary benchmark on the day of inspection. The elevation of the water level was subsequently obtained from the U.S.G.S.

B. Geology and Subsurface Materials:

The topography around the site can be described as rolling to hilly. The subsurface materials in upland areas generally consist of about 2 to 5 ft of loess underlain by a glacial till. Geological maps of the area indicate that the bedrock is the Cherokee group of the upper Desmoinesian series of the Pennsylvanian system. The Cherokee group consists of cyclic deposits of sandstone, siltstone, shale, underclay, limestone, and coal beds.

The U.S.G.S. 7.5 minute quadrangle sheets for the area (Millersburg and Millersburg NE, Missouri, 1969) indicate several strip mines to the east and to the north of the dam. No strip mines were noted within the drainage area of this lake.

The profile shown on Sheet 2 of Appendix A indicates line borings and apparently shows where bedrock was encountered. However, no boring plan or description of the soils encountered are available.

C. Foundation and Embankment Design:

No foundation and embankment design information was available. The design plans present cross sections of the embankment, and typical cross sections are shown on Sheet 3 of Appendix A. A core trench apparently was constructed at the base of the dam along its entire length. There is apparently no particular zoning of the embankment, and no internal drainage features are known to exist. No construction inspection test results have been obtained.

D. Hydrology and Hydraulics:

The Missouri Department of Conservation has provided hydrologic and hydraulic design computations for Little Dixie Dam. Based on these data, a field check of spillway dimensions and embankment elevations, and a check of the drainage area on U.S.G.S. quad sheets, a hydrologic analysis using U.S. Army Corps of Engineers guidelines was performed and appears in Appendix C, Sheets 1 to 6. It was concluded that the primary and emergency spillways combined will pass 36 percent of the Probable Maximum Flood.

E. Structure:

Structural design computations for appurtenant structures were not obtained. Details of all concrete structural elements (riser structure, etc.) are shown on the Design plans and are presented in Appendix A.

F. Construction:

No construction inspection data have been obtained.

G. Operation and Maintenance:

No information regarding normal operation and maintenance was avaible. The visual inspection indicates that maintenance of the dam (mowing the grass and brush removal) is done periodically. It is reported that the lake was drawn down 10 ft in 1975 to facilitate removal and replacement of the intake feed line structure and pipes.

2.3 EVALUATION:

No design computations or construction records were available for this dam. Thus, the engineering data available were inadequate to make a detailed assessment of the design, construction, and operation.

Seepage and stability analyses comparable to the requirements of the "Recommended Guidelines for Safety Inspection of Dams" were not available, which is considered a deficiency. These seepage and stability analyses should be performed for appropriate loading conditions (including earthquake loads) and made a matter of record.

SECTION 3 - VISUAL INSPECTION

3.1 GENERAL:

The field inspection was made on 23 August 1978. The inspection team consisted of personnel from Anderson Engineering, Inc. of Springfield, Missouri and Hanson Engineers, Inc. of Springfield, Illinois. The team members were:

Roger Phillips - Anderson Engineering, Inc. (Instrument Man)
Steve Brady - Anderson Engineering, Inc. (Civil Engineer)
Jack Healy - Hanson Engineers, Inc. (Geotechnical & Structural Engineer)
Gene Wertepny - Hanson Engineers, Inc. (Hydraulics Engineer)

3.2 DAM:

The dam is an earth fill embankment. The location of the borrow area is not known. Based on available surficial soil information for the area, the fill material would be expected to consist of low plasticity clays and silts.

The embankment is grass-covered and appears to be in good condition. A few small trees are growing near the emergency spillway entrance on the lake side. No sloughing of the embankment or seepage through or under the embankment was evident. No animal burrows were noted. There was some slight erosion on the dam side of the chute spillway exit. The 24 in. diameter steel pipe lake drain outlet was in good condition and was dry. The gate valve structure was also in good condition.

The horizontal alignment appeared as designed. No surface cracking or unusual movement was obvious. It should be noted, however, that the elevation of the center of the dam which was obtained in the field was approximately 1.2 ft lower than as indicated on the Design Plans (see Section 1.3.B of this report). All other elevations obtained in the field agreed fairly well with those indicated on the Design Plans. The discrepancy at the center of the dam might be explained by the possibility of some post construction settlement of the center portion of the dam.

No instrumentation (monuments, piezometers, etc.) was observed.

A. Primary Spillway and Outlet:

Three vertical cracks were evident in the weir wall of the intake structure. Two of the cracks were leaking slightly. Also leaking was the lower portion of the joint where the weir wall meets the abutment of the bridge which spans the chute spillway.

The concrete bridge is generally in good condition except for some concrete spalling and cracking at the north abutment on both sides of the bridge where the deck is supported. This bridge is used for access to parts of the dam which are separated by the chute spillway and is not open to public traffic. The chute spillway is in good condition.

Minor weed growth in the approach channel of the primary spillway was noted. The outlet channel was covered with weeds, brush and small trees. No sloughing of the outlet channel slopes was noted.

B. Emergency Spillway:

The emergency spillway is in good condition. It measures 100 ft in width with 3H:1V side slopes. The base and side slopes of the emergency spillway are grass-covered. No erosion was noted, and it appears that the emergency spillway has never been used.

3.3 RESERVOIR AND WATERSHED:

The immediate periphery of the lake was grass and timber-covered with moderate slopes. No sloughing or serious erosion of reservoir banks was noted.

3.4 EVALUATION:

Small tree growths noted near the emergency spillway entrance on the lake side of the dam should be removed, and all future growth should be removed on a yearly basis. Grass and weeds should be cut around the primary spillway crest. Excessive growths in this area could cause entrance restrictions. In addition, the outlet channel of the primary spillway should be cleared. Minor erosion (previously discussed), if left uncontrolled or uncorrected, could lead to serious problems in the future. These deficiencies should be able to be corrected by normally scheduled routine maintenance.

The cracks in the weir walls should be sealed to prevent future deterioration due to freeze-thaw conditions. The bridge over the primary chute spillway should be checked by a structural engineer to assure its adequacy. Necessary repairs can subsequently be made.

Because the valve of the lake drain is located on the downstream side of the dam, the full head of water impounded by the dam is acting entirely through the dam. The area around the lake drain outlet should be periodically inspected for seepage which might indicate a leak or rupture of the drain pipe and could eventually initiate a piping failure through the embankment.

Photographs of the dam, appurtenant structures, and the reservoir and watershed are presented in Appendix D.

SECTION 4 - OPERATIONAL PROCEDURES

4.1 PROCEDURES:

Although there are controlled outlet works for this dam, no regulating procedures are known to exist. The pool is normally controlled by rainfall, runoff, evaporation and the capacities of the uncontrolled spillways. The rearing pool feed line is used to maintain the water level in the fish rearing pools. It is reported that the lake was drawn down 10 ft in 1975.

4.2 MAINTENANCE OF DAM:

No maintenance information was available. Maintenance of the dam (mowing the grass and brush removal) is apparently done periodically.

4.3 MAINTENANCE OF OPERATING FACILITIES:

Although the drawdown facilities appear to be in good condition, it is not known whether they are regularly maintained.

4.4 DESCRIPTION OF ANY WARNING SYSTEM IN EFFECT:

The inspection team is unaware of any existing warning system for this dam.

4.5 EVALUATION:

Tree and brush growth should be removed from the dam and outlet channel on a yearly basis. Erosional areas as previously discussed should be repaired. The use of riprap to prevent future erosion in these areas is a possibility.

SECTION 5 - HYDRAULIC/HYDROLOGIC

5.1 EVALUATION OF FEATURES:

A. Design and Experience Data:

Design computations used by the Missouri Conservation Commission to design this dam were provided by the Missouri Department of Conservation. Based on this information, a field check of spillway dimensions and embankment elevations, and a check of the pool and drainage areas from U.S.G.S. quad sheets (Millersburg, Missouri and Millersburg NE, Missouri quad sheets), a hydrologic analysis using U.S. Army Corps of Engineers guidelines was performed and appears in Appendix C, Sheets 1 to 6.

B. Visual Observations:

The weir walls in the inlet structure of the primary spillway are cracked and leaking. The concrete chute spillway appears to be in good condition. The earth-and grass-covered emergency spillway is in good condition. The emergency spillway has apparently never been used.

Facilities available to draw down the pool appear to be in good condition. The primary spillway is located near the west end of the dam, and the emergency spillway is located on the east abutment. Spillway releases would not be expected to endanger the integrity of the dam.

C. Overtopping Potential:

Based on the hydrologic and hydraulic analysis as presented in Appendix C, the combined primary and emergency spillways will pass 36 percent of the Probable Maximum Flood. The Probable Maximum Flood is defined as the flood discharge that may be expected from the most severe combination of critical meteorologic and hydrologic conditions that are reasonably possible in the region. The recommended guidelines from the Department of the Army, Office of the Chief of Engineers, require that this structure (intermediate size with high downstream hazard potential) pass 100 percent of the PMF, without overtopping. The structure will pass a 100-year frequency flood without overtopping.

The routing of the PMF through the spillways and dam indicated that the dam will be overtopped by 1.99 ft at elevation 838.29. The duration of the overtopping will be 5.08 hours, and the maximum outflow will be 19,581 cfs. Fifty percent of the PMF will overtop the dam by .72 ft with a duration of overtopping of 2.75 hours and a maximum outflow of 8295 cfs.

SECTION 6 - STRUCTURAL STABILITY

6.1 EVALUATION OF STRUCTURAL STABILITY:

A. Visual Observations:

No serious deficiencies which would affect the structural stability of this dam were noted during the field inspection. However, if left unchecked, the erosion on the dam side of the chute spillway exit could cause some localized stability problems in the future. In addition, the cracks in the weir walls at the inlet to the chute spillway should be sealed.

B. Design and Construction Data:

No design and construction data for the foundation and embankment were obtained. Seepage and stability analyses comparable to the "Recommended Guidelines for Safety Inspection of Dams" were not available.

C. Operating Records:

No operating records of the drawdown facilities are available, although it is reported that the lake was drawn down 10 ft in 1975 to facilitate removal and replacement of the intake feed line structure and pipes.

D. Post-Construction Changes:

According to Missouri Department of Conservation personnel, the water intake feed line structure and pipes were replaced in 1975.

E. Seismic Stability:

The structure is located in seismic zone 1, which is historically the least active zone in terms of occurrence and magnitude of earthquakes. The seismic loading prescribed for zone 1 is generally not critical for a well-constructed earth dam of this size.

SECTION 7 - ASSESSMENT/REMEDIAL MEASURES

7.1 DAM ASSESSMENT:

A. General:

This Phase I inspection and evaluation should not be considered as being comprehensive since the scope of work contracted for is far less detailed than would be required for an in-depth evaluation of dams. Latent deficiencies, which might be detected by a totally comprehensive investigation, could exist.

B. Safety:

The embankment itself is generally in good condition. The minor items which have been noted previously--such as tree growth, concrete cracking and erosion--can and should be corrected and controlled. Seepage and stability analyses comparable to the requirements of the "Recommended Guidelines for Safety Inspection of Dams" were not available, which is considered a deficiency.

The dam will be overtopped by flows in excess of 36 percent of the Probable Maximum Flood. Overtopping of an earthen embankment could cause serious erosion and could possibly lead to failure of the structure.

C. Adequacy of Information:

The conclusions in this report were based on review of the Design Plans, the performance history as related by others and the U.S.G.S. Gaging Station and visual observation of external conditions. The inspection team considers that these data are sufficient to support the conclusions herein.

D. Urgency:

The remedial measures recommended in paragraph 7.3 should be accomplished in the near future. If the minor deficiencies listed in paragraph B are not corrected and if good maintenance is not provided, the embankment condition will continue to deteriorate and possibly could become serious in the future.

E. Necessity for Phase II:

Based on the result of the Phase I inspection, no Phase II inspection is recommended.

F. Seismic Stability:

The structure is located in seismic zone 1, which is historically the least active zone in terms of occurrence and magnitude of earthquakes. The seismic loading prescribed for zone 1 is generally not critical for a well-constructed earth dam of this size.

7.2 FURTHER INVESTIGATIONS:

Cracking and spalling of the concrete at the bridge-abutment contact on the south side of the spillway bridge were noticed during the visual inspection. This bridge should be checked by a structural engineer to assure its adequacy; necessary repairs can then be made. Seepage and stability analyses should be performed by a professional engineer experienced in the design and construction of dams.

7.3 REMEDIAL MEASURES:

The following remedial measures and maintenance procedures are recommended and should be supervised by an engineer experienced in the design and construction of dams:

(1) Remove the existing tree and brush growth in the discharge channel of the primary spillway, and remove all future tree and brush growth on a yearly basis. Cut the weeds around the approach channel to the primary spillway to prevent restrictions. Remove the small area of trees near the entrance to the emergency spillway.

(2) Seal the cracks in the weir walls and the joints at the weir wall and bridge abutment contacts.

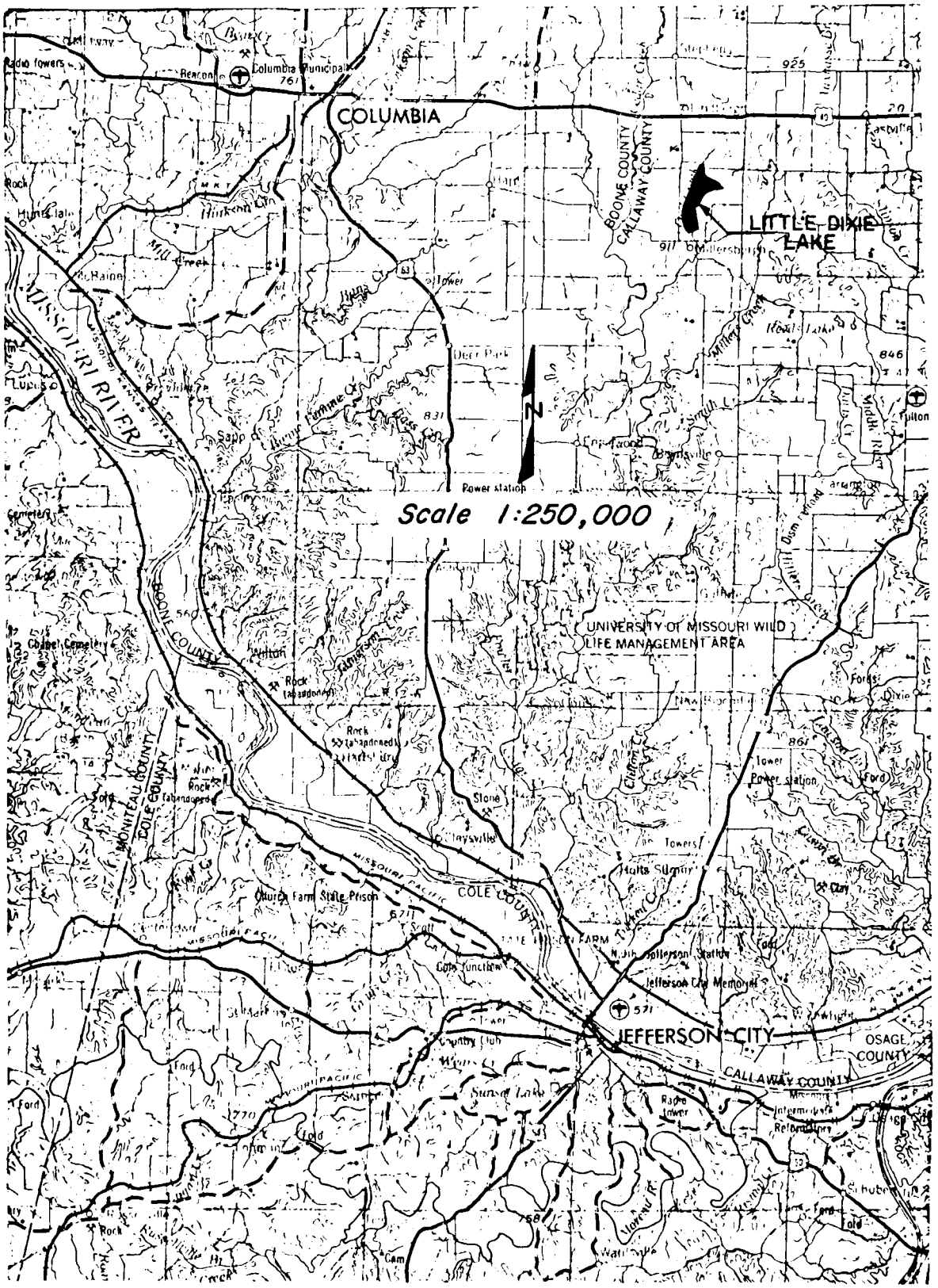
(3) Correct the minor erosion activity on the dam side of the chute spillway exit.

(4) Check the downstream slope periodically for seepage and stability problems, especially around the lake drain pipe. If wet areas or seepage flows are observed, or if sloughing is noted, then the dam should be inspected and the situation evaluated by an engineer experienced in design and construction of dams.

(5) A detailed inspection of the dam should be made at least every 5 years by an engineer experienced in the design and construction of dams. More frequent inspections may be required if slides, seeps, or other items of distress are observed.

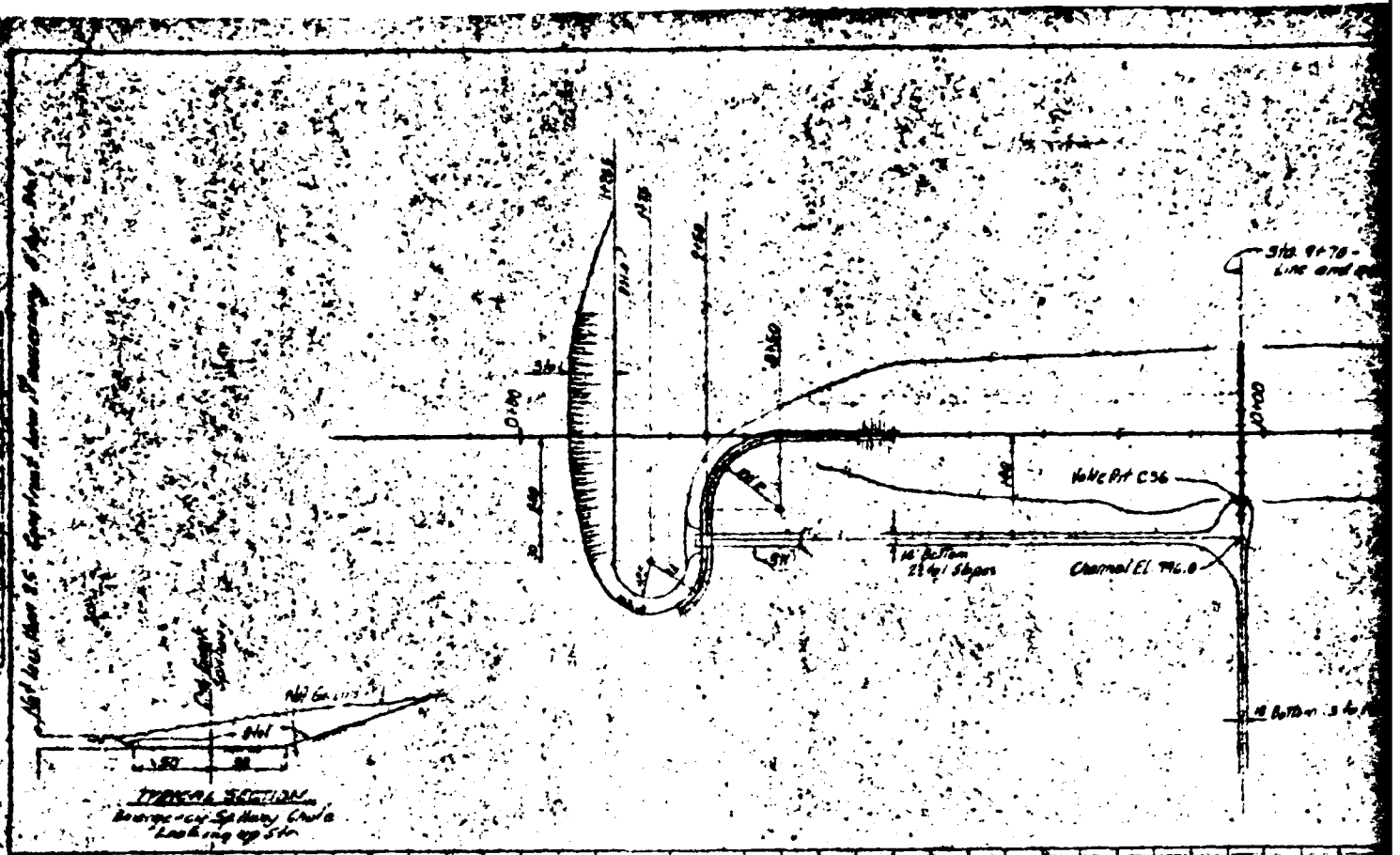
(6) Spillway size and/or height of dam should be increased to pass the PMF. In either case, the spillway should be protected to prevent erosion.

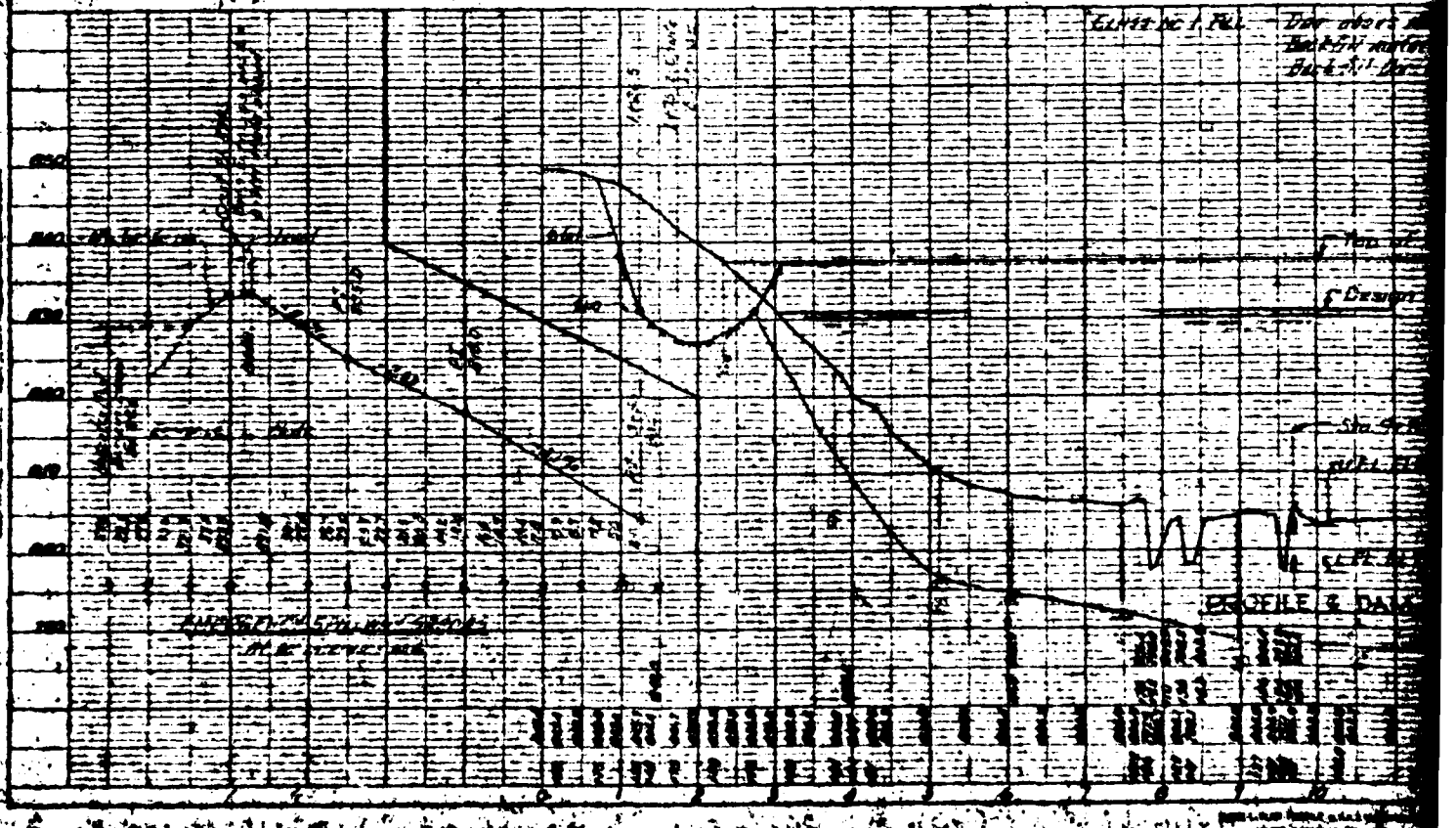
APPENDIX A

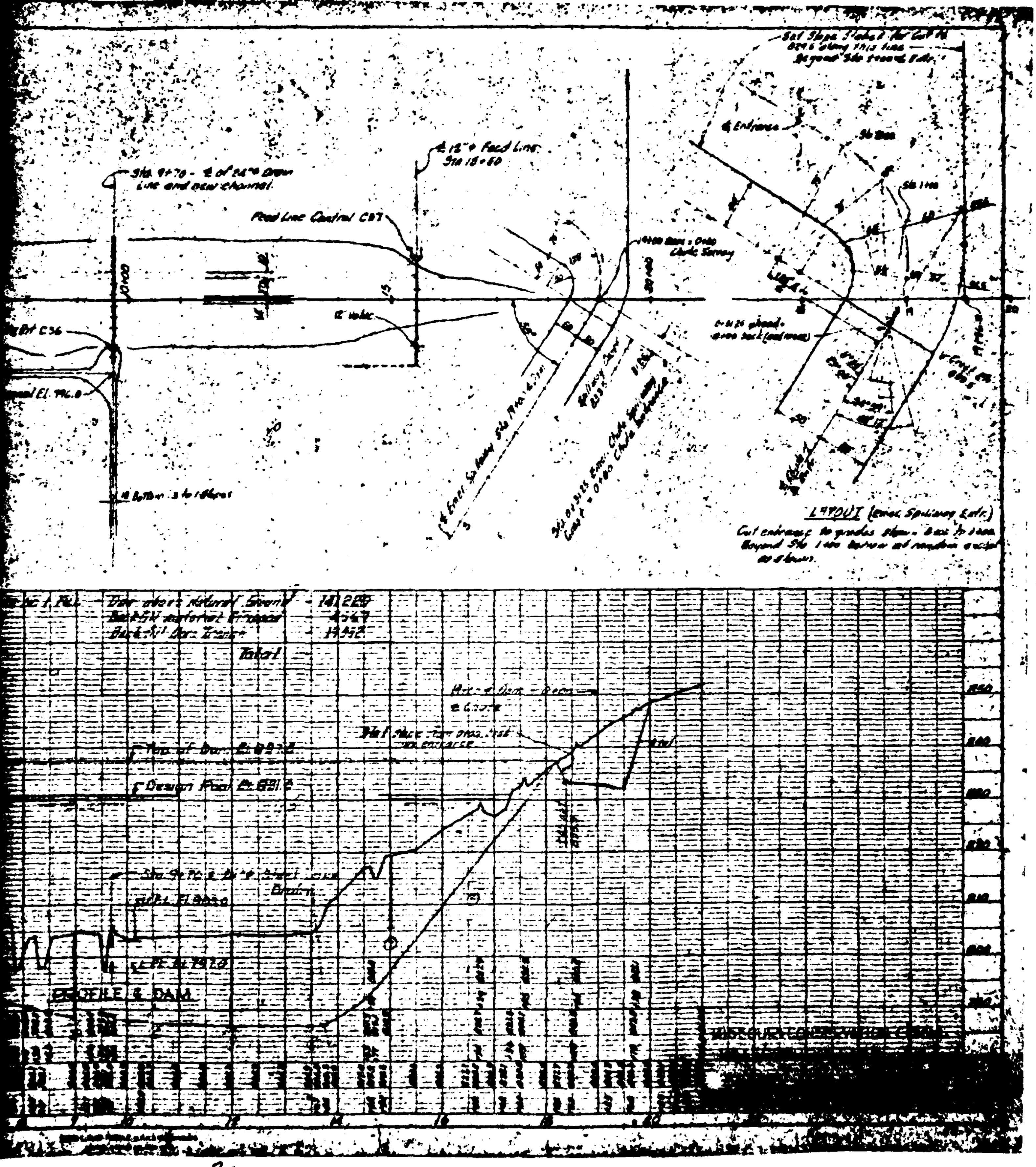


SITE VICINITY MAP

SHEET I, APPENDIX A

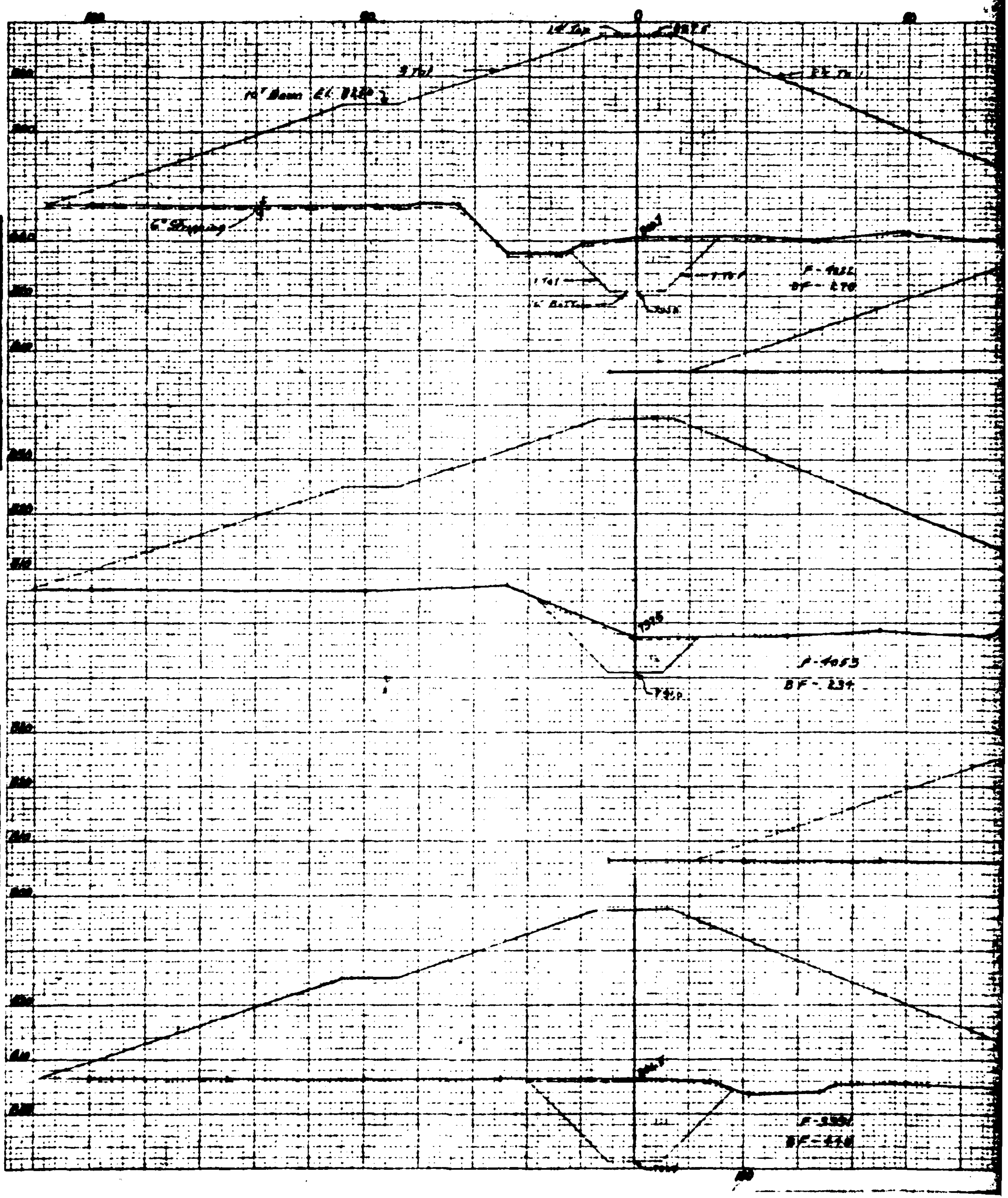

Valve Pit C36
Channel El 796.0
TYPICAL SECTION



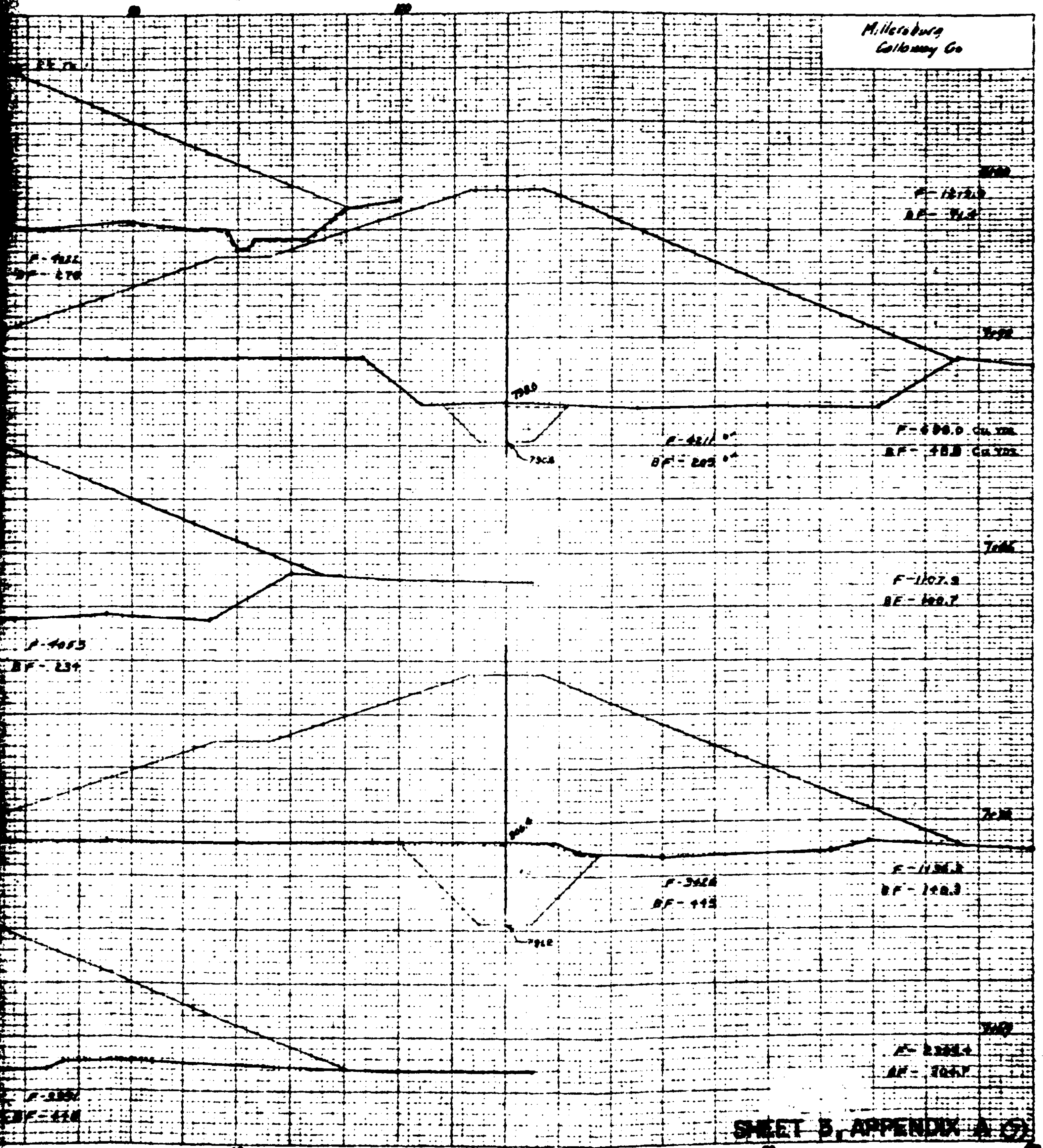


12

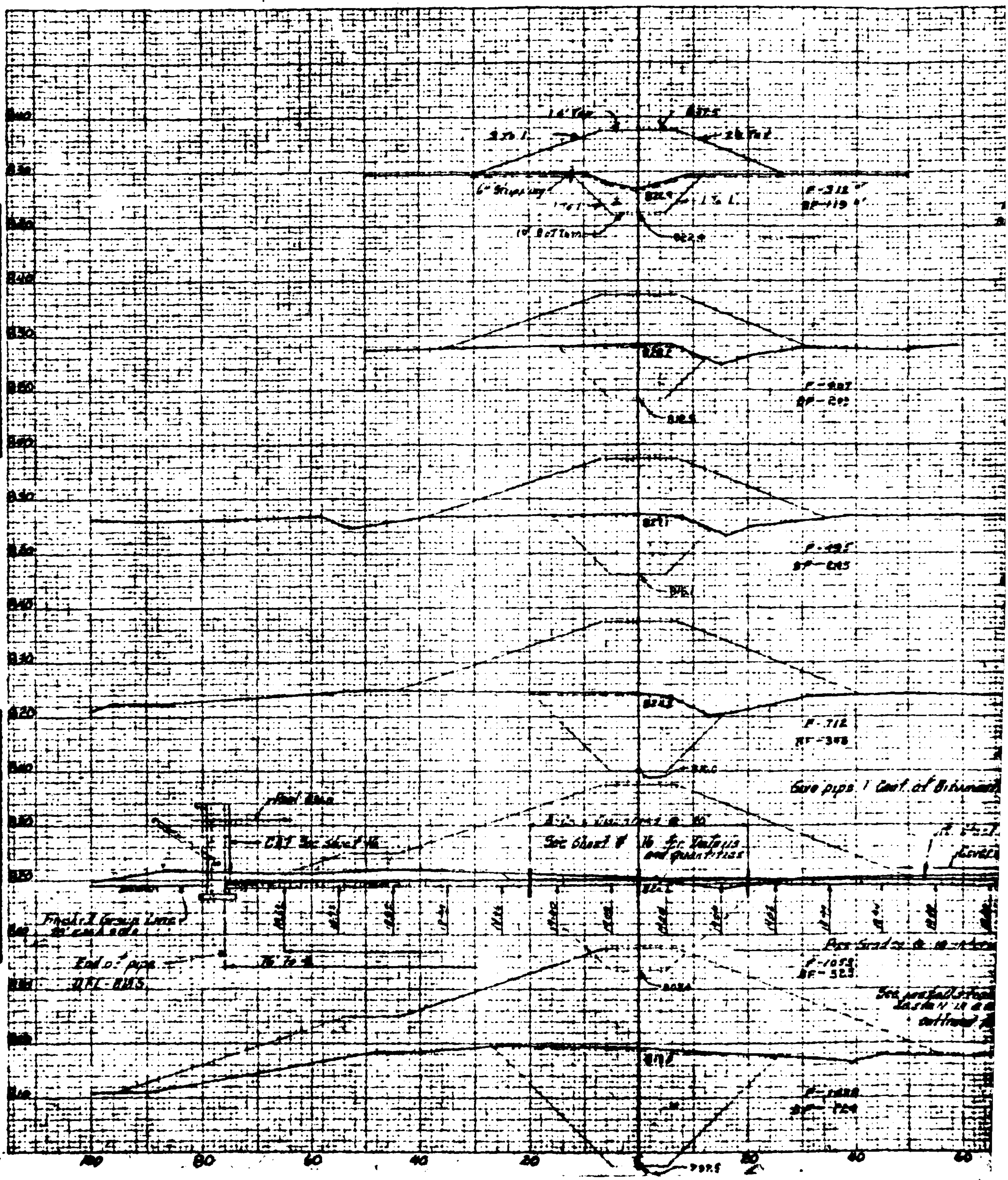
2

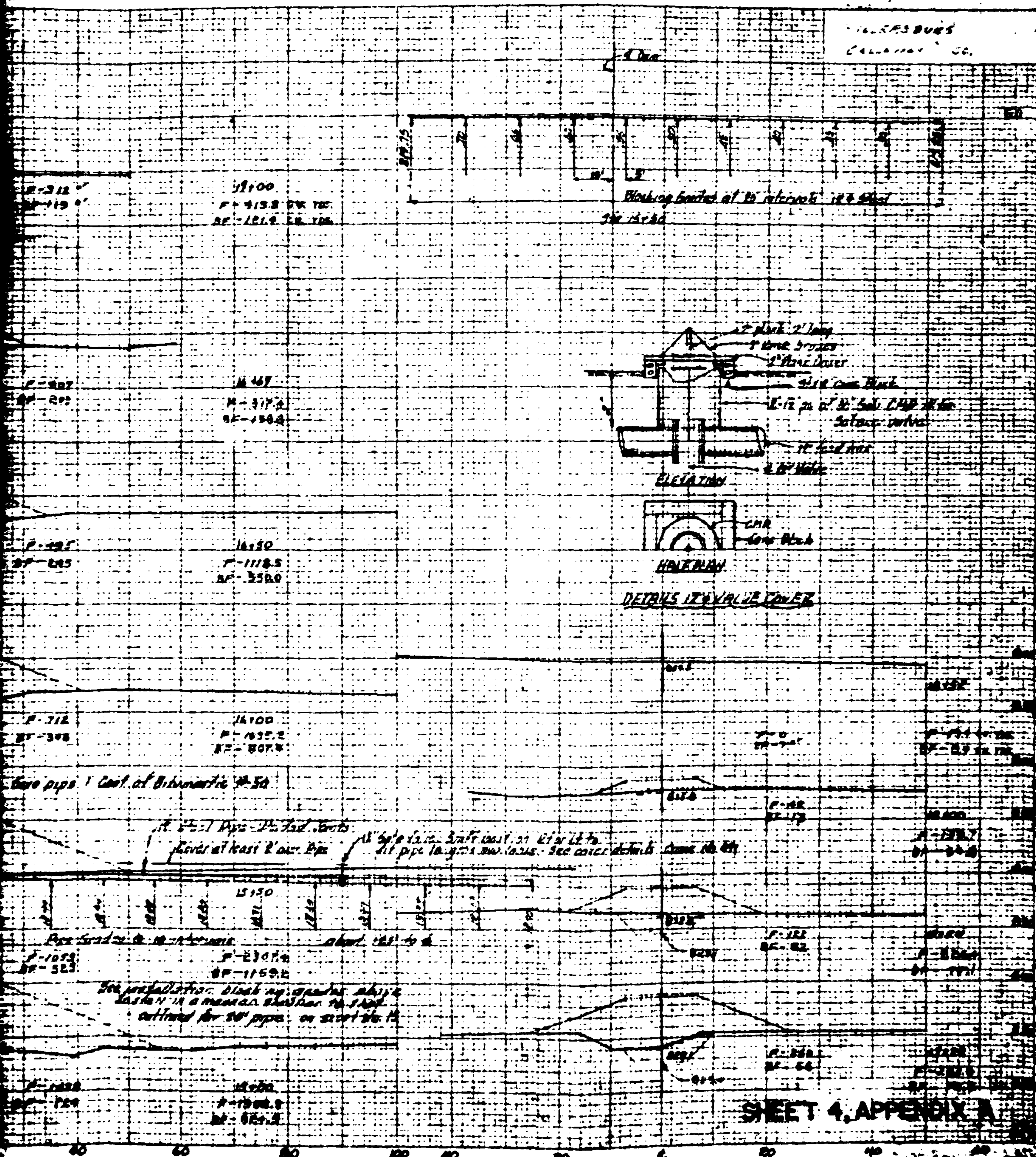


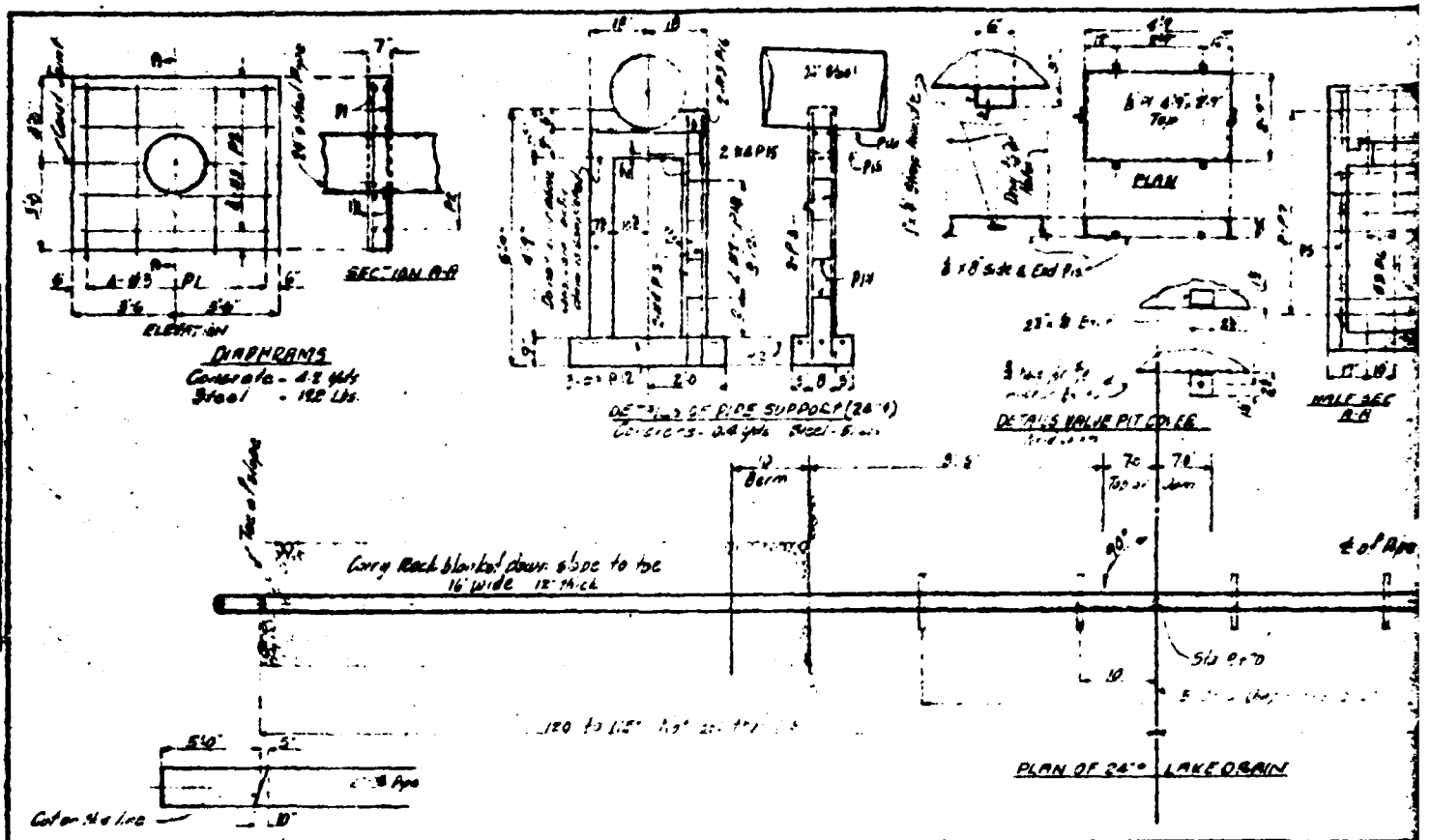
F - 4053
BF - 234

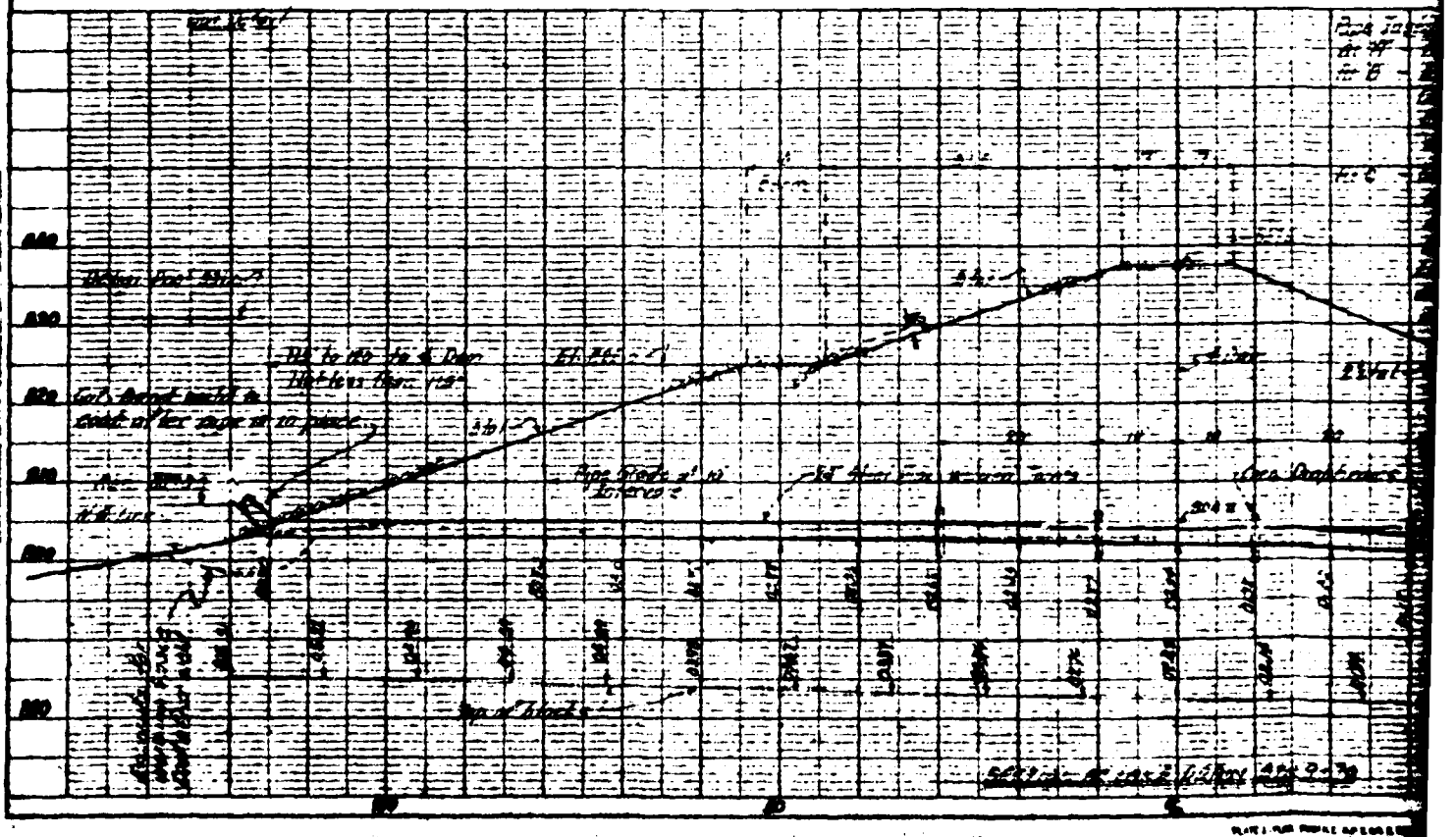


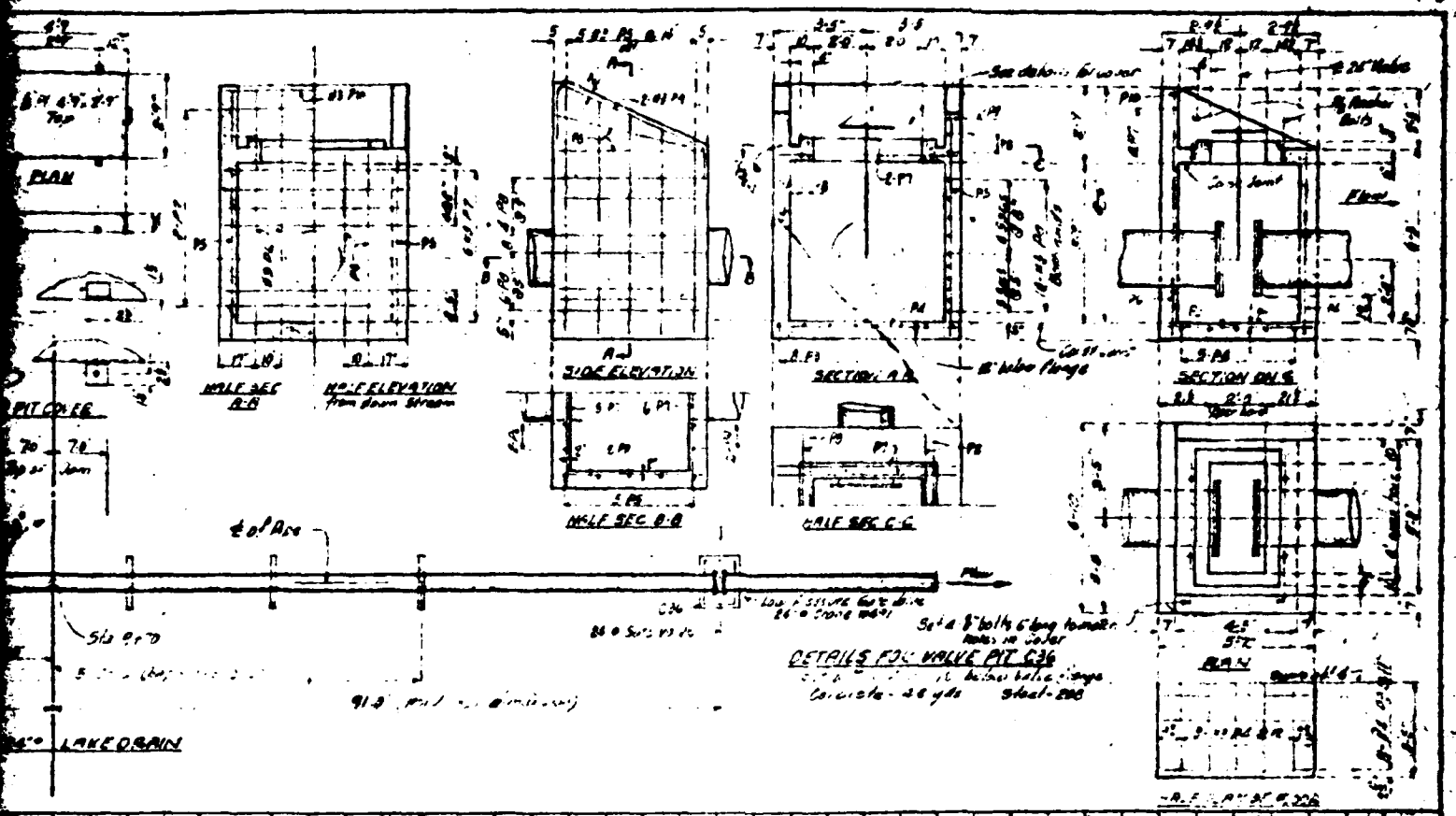
SHEET 5, APPENDIX A (5)

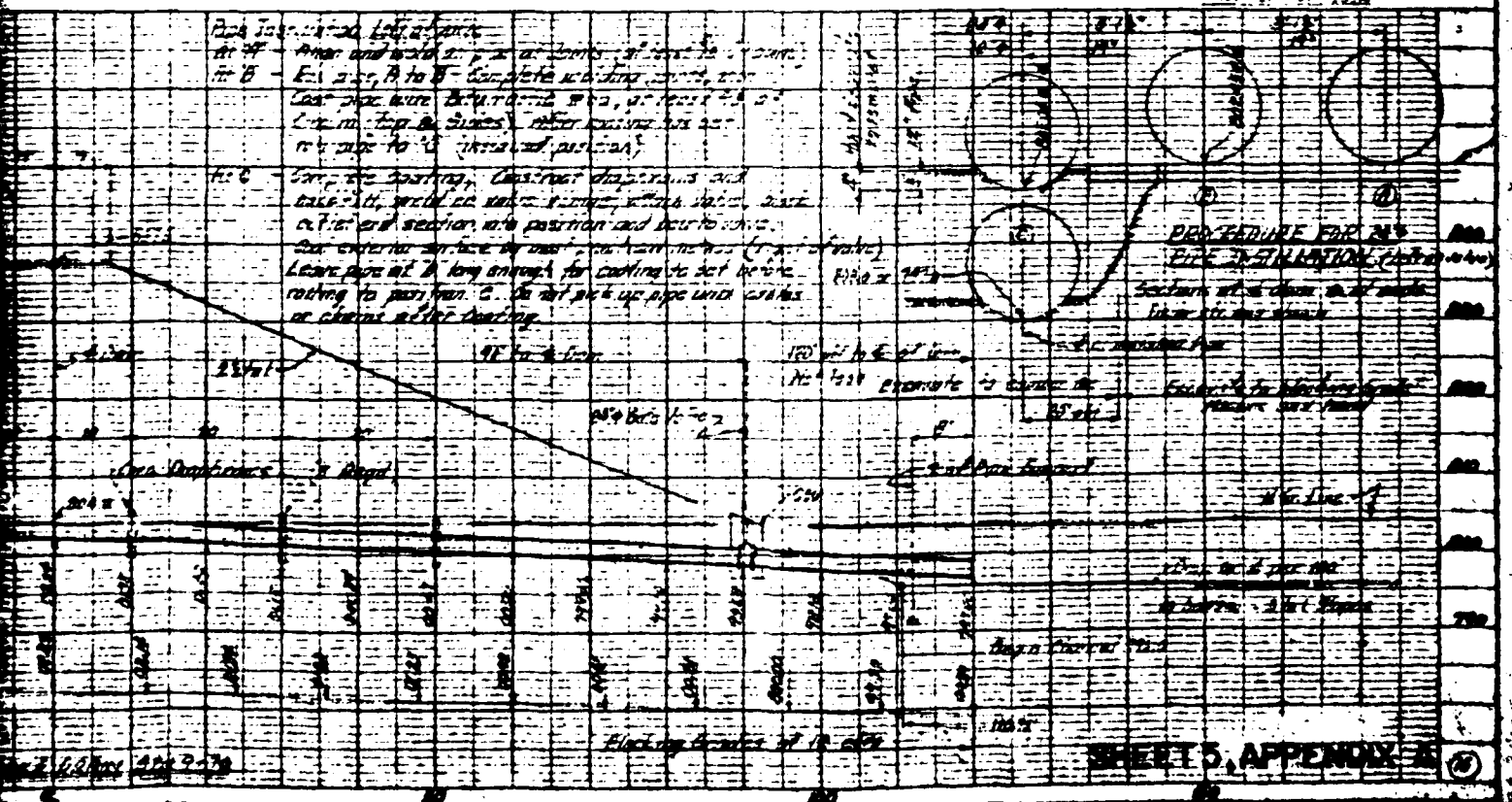

14' Top
837.5
3 to 1
2½ to 1
6" Stripping
822.9
822.4
10' Bottom
F-312
BF-119
F-907
BF-202
F-495
BF-285
F-712
BF-348
Core pipe 1 Coat of Bituminous
See Sheet # 16 for Details and Quantities
Final Grade Line
End of pipe
F-1052
BF-323
F-1438
BF-724
797.5
100
80
60
40
20
20
40
60


ELEVATION
HALF PLAN
DETAILS 12" VALVE COVER
SHEET 4, APPENDIX A

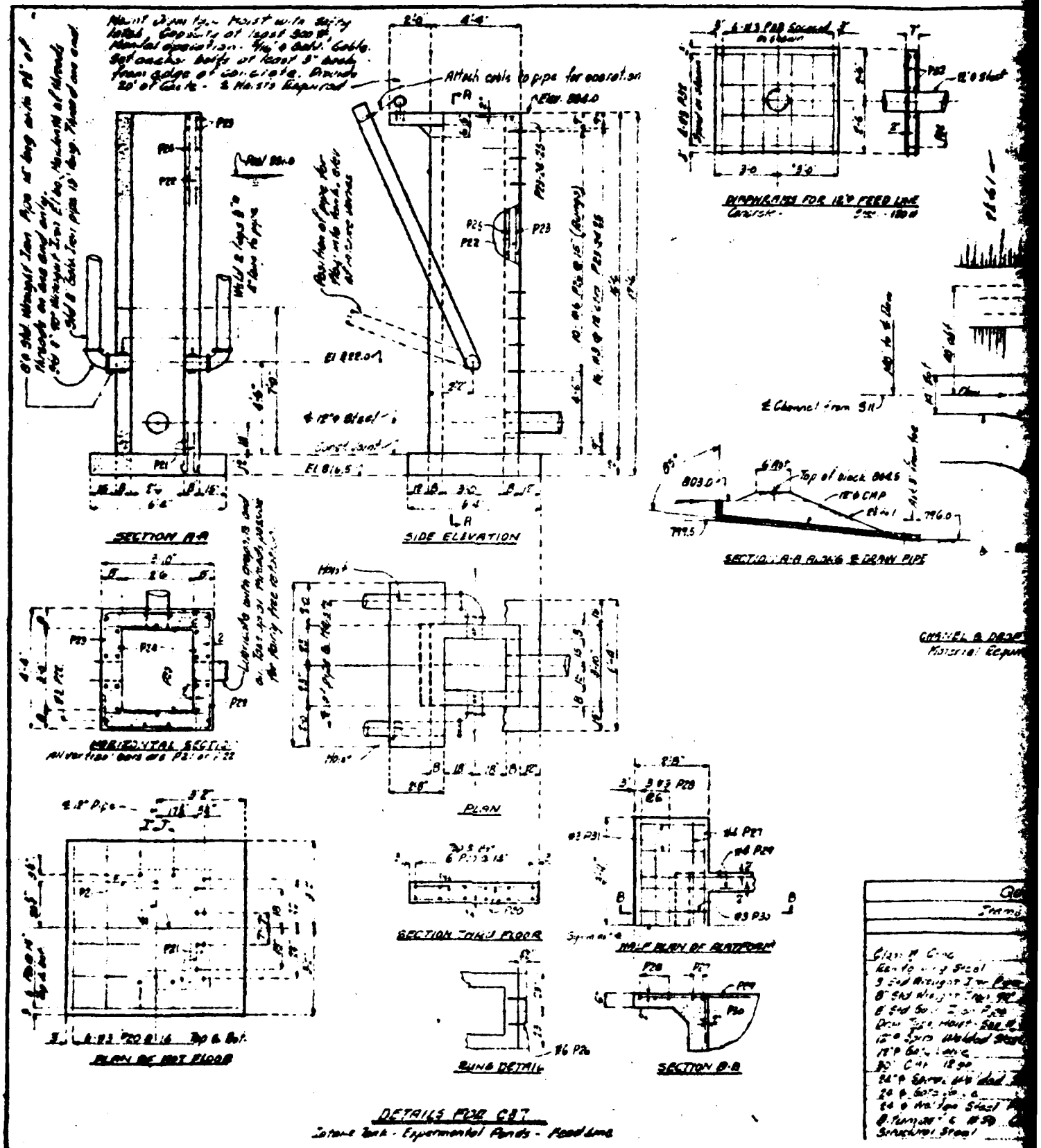

SECTION A-A
ELEVATION
DIAPHRAMS
Concrete - 4.2 yds
Steel - 192 Lbs.
PLAN
Carry Rock blanket down slope to be 16' wide
PLAN OF 24" LAKE DRAIN

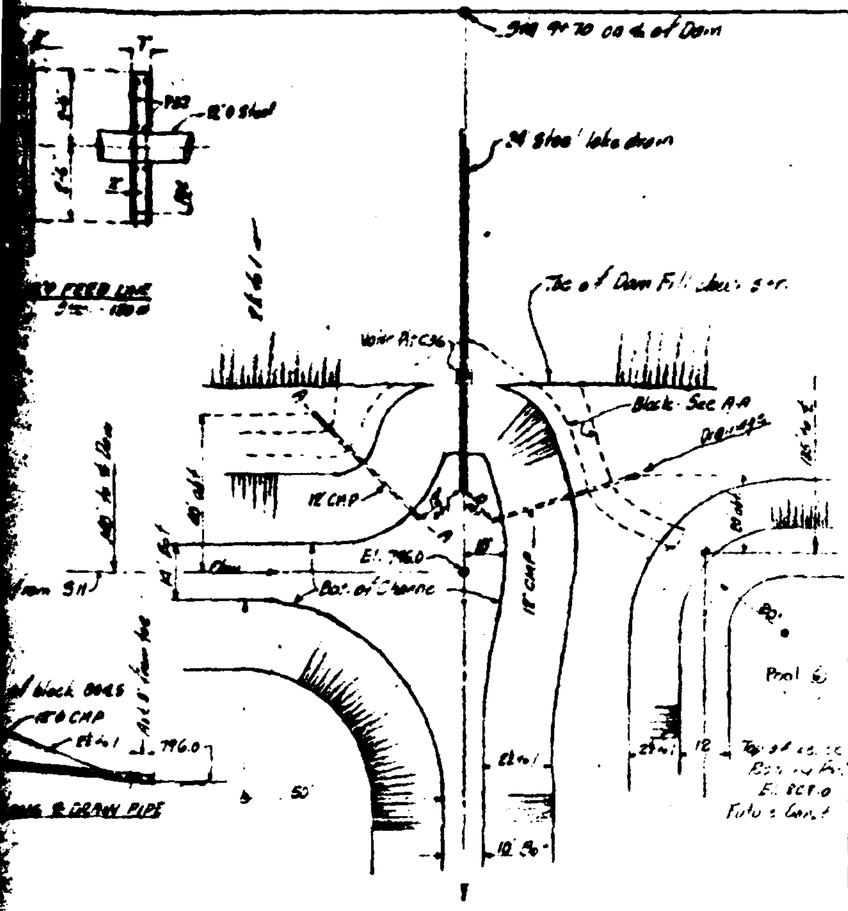






SHEET 5, APPENDIX


SECTION A-A
SIDE ELEVATION
HORIZONTAL SECTION
PLAN
PLAN OF MAT FLOOR
SECTION THRU FLOOR
HALF PLAN OF PLATFORM
SECTION B-B
SUMP DETAILS
DIAPHRAGM FOR 18" FEED LINE
SECTION A-B ALONG 8" DRAIN PIPE
DETAILS FOR CBT
Intake Tank - Experimental Ponds - Feed Line



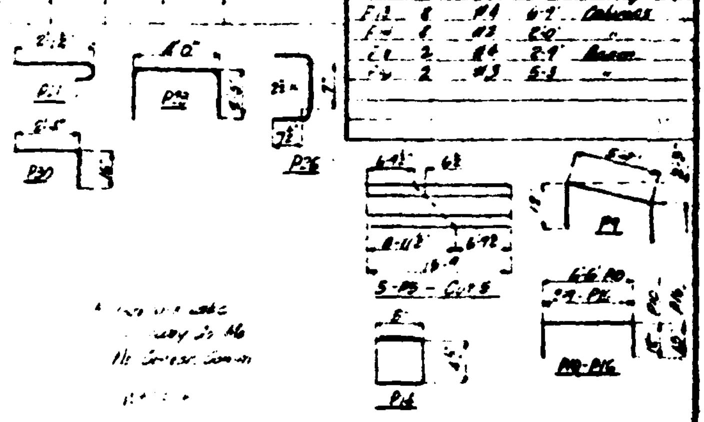
CHANNEL & DROP INLET DRAIN PIPE DETAILS AT OUTLET END OF LAKE DRAIN

Material Required – 4-Sections of 12" CMP 18 long
2-2 Pc. Elbos 45° bend 12"
2-Pcs 12" CMP 2-0 long.
6-Std Bands
All 16 ga.

REINFORCING STEEL

Mark	No.	Size	Length	Location
Intake Tank – For Feed Line C37				
P20	24	#3	6-0	Bot. Slab
P21	22	#3	2-6	Slab & walls
P..	22	#3	16-3	Walls
P23	34	#3	8-4	"
P24	34	"	4-0	"
P25	34	"	8-6	"
P26	10	#6	2-6	Rings & wall
P27	2	#4	7-6	Pilaster
P28	3	#3	7-6	
P29	4	#4	8-5	"
P30	2	#3	3-4	"
P31	4	"	2-6	"
Diaphragms For 18" Feed Line				
P32	28	#3	3-4	
P33	36	#3	5-0	

Mark	No.	Size	Length	Location
Diaphragms 24" Steel				
P1	40	#3	6-0	
P2	40	#3	6-9	
Valve Pit 24" C36				
F2	8	#4	3-2	Floor
P4	9	#3	6-9	Floor & walls
P5	5	#3	18-4	"
P6	4	#3	9-8	"
P7	18	#3	6-6	Walls & Top
P8	28	#3	3-3	"
P9	4	#3	7-0	Top of walls
F10	1	#3	8-6	"
Pipe Support 24"				
P12	3	#3	3-4	Footing
F13	8	#4	6-2	Columns
F14	8	#3	2-0	"
C..	2	#4	2-9	Beam
F..	2	#3	5-3	"



Bars to be cut and bent as indicated, wired into bundles & identified

QUANTITIES

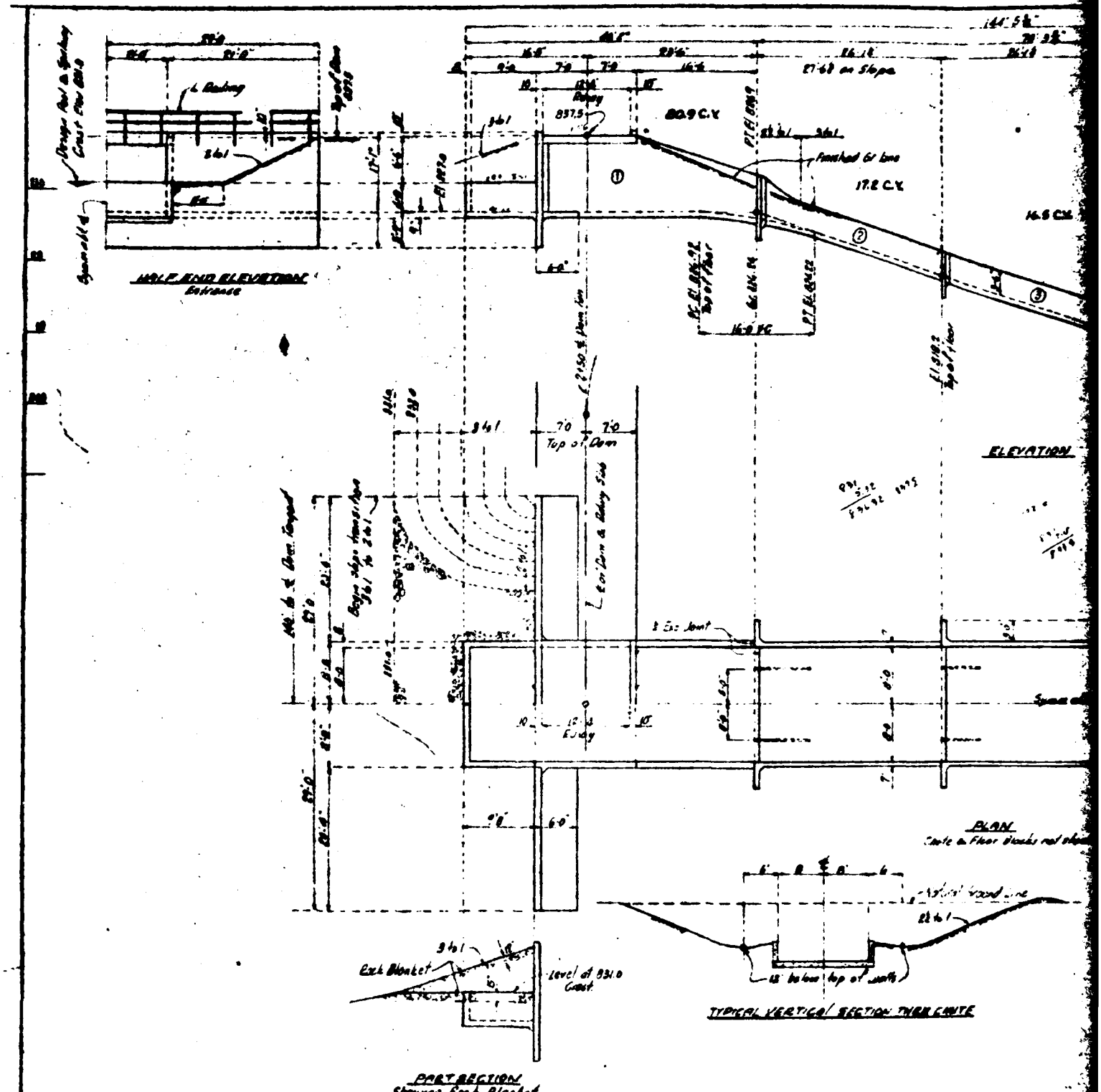
Item		Lake Drain	Feed Line To Pools
Class A Conc	Cu Yds	94	-
Reinforcing Steel	Lbs	451	
3 Std Wrought Iron Pipe	Lin Ft	-	893
8 Std Wrought Iron 90° Ell	No	-	2
8 Std Galv Iron Pipe	Lin Ft	-	26
Draw Type Hydrant – See Sheet	No	-	8
12" Spiral Welded Steel Pipe	Lin Ft	-	200
18" Gate Valve	No	-	1
30" CMP 18 ga	Lin Ft	-	2
24" Spiral Welded Steel Pipe	"	840	-
24" Gate Valve	No	1	-
24" Welded Steel Flanges	No	2	-
Bitumastic No 50 Coating	Gals	30	15
Structural Steel	Lbs		132

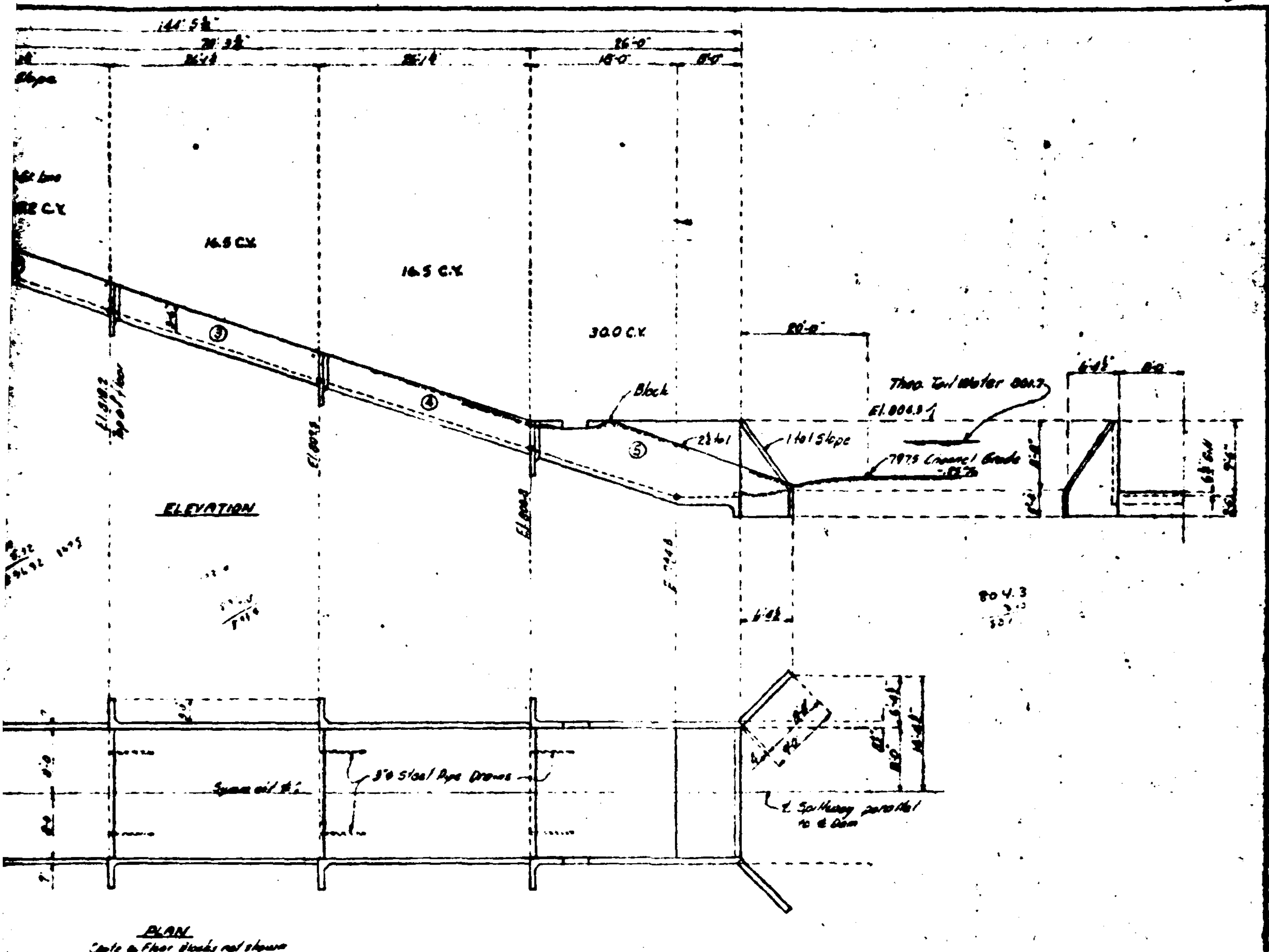
SHEET 6, APPENDIX A

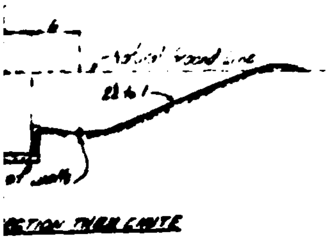
Mo Conservation Commission
County Lake at Milersburg
Callaway County

MICROFILMED
DATE

6 2


ELEVATION
PLAN
PART SECTION
Showing Rock Blanket
TYPICAL VERTICAL SECTION THRU CHUTE
Sheet 1 of 6





GENERAL NOTES.

All exposed corners to be beveled abt ¾" except as noted. Use edging tool along both corners of wear walls and on each side of expansion joint in floor. Use ¾" bevel strip each side of expansion joints in walls and over top.

Construction joints must be constructed accurate and true to plans. Care must be exercised in placing the [illegible] and joint filler so as to obtain a joint free to move without binding. Anchor joint material to one face of concrete by means of copper wire or galv. nails.

Construction joints must be clean and free of laitance.

Chute and floor blocks must be cast in place as soon as possible and not later than day after placing floor.

[illegible] tamp all back fill, with caution.

Paint Steel Rail. - Shop - 1 coat red lead and oil. Field - spot with red lead + 2 coats of Exterior Aluminum for steel.

SHEET 7, APPENDIX A

QUANTITIES		
Class A Concrete	Cu. Yds.	161.1
Reinforcing Steel	Lbs.	15380
Structural Steel	Lbs.	1998
3"Ø Std. Galv. Steel Pipe Drains	Lin. Ft.	40
Porous Back Fill	Cu. Yds.	
Excavation for Structure	Cu. Yds.	[illegible]

MISSOURI CONSERVATION COMMISSION

MILLERSBURG LAKE

County - Callaway
Location - 10.5 Miles N.W. of Fulton

Design
Drawn Aug 57 P.C.L.

CONCRETE CHUTE Spillway

Submitted
Approved

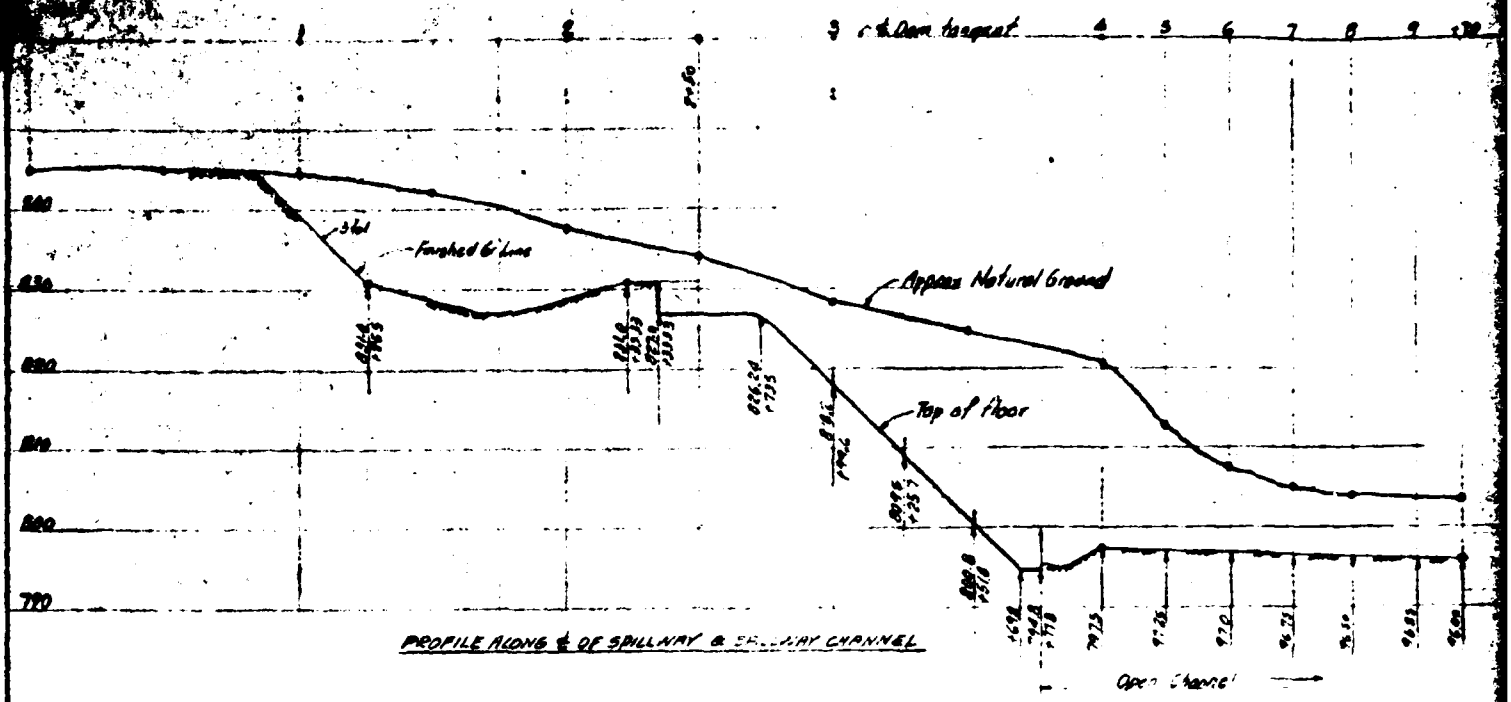
Sheet [illegible]
Drawing [illegible]

MICROFILMED
DATE

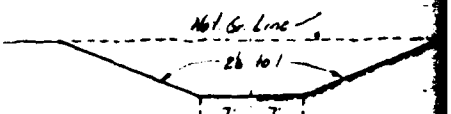
Sheet 1 of 6

7

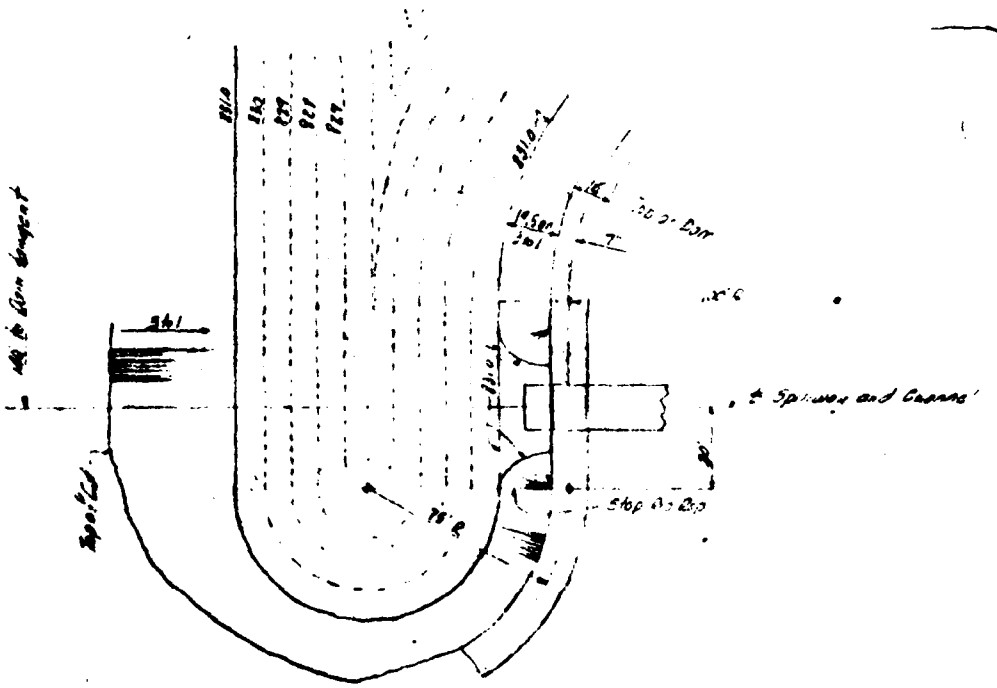
2



PROFILE ALONG ℄ OF SPILLWAY & SPILLWAY CHANNEL

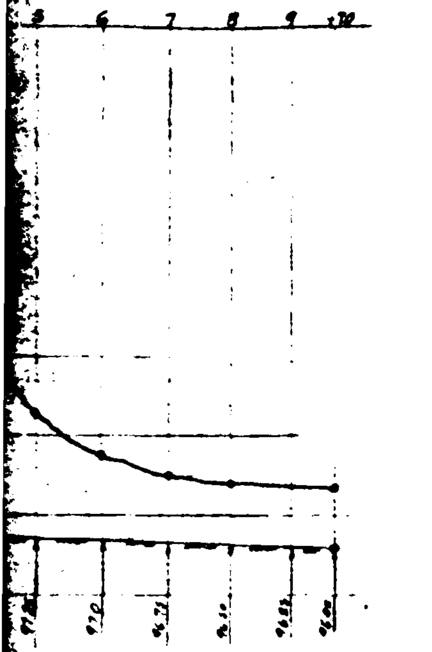


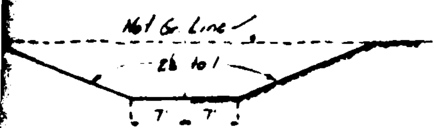
TYPICAL CHANNEL SEC.



PART PLAN OF SPILLWAY ENTRANCE

See Sheet No 8 for comp etc Spillway Inlet



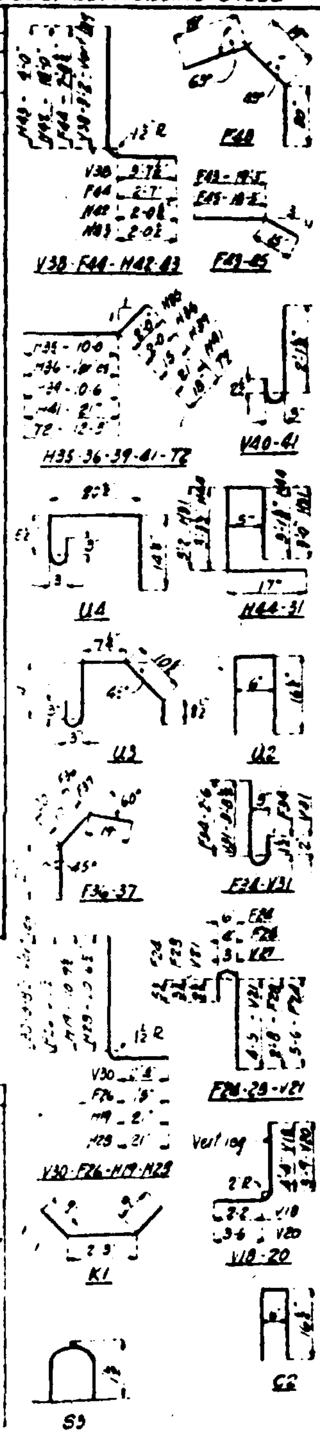


TYPICAL CHANNEL SEC

BILL OF REINFORCING STEEL

Mark	No	Size	Length	Location
		SECTION No 5		
F40	8	#3	10-0	Wing Wls Both faces
F41	22	#4	12-9	Bottom of Floor
F42	12	#3	15-0	" " "
F43	12	"	20-6	" " "
F44	15	#4	10-6	Top of Floor
F45	15	"	19-6	" " "
F46	13	#5	17-3	" " "
F47	35	#4	17-3	" " " & Cutoff wl
F48	12	"	4-6	Floor & " "
F49	2	#3	4-9	Cutoff wl near face
F50	3	"	23-3	" " " top & far face
V38	86	#4	7-0	Wls & Sec of Floor
V39	3	"	8-0	Wls Fill face
V40	86	"	2-9	Floor & Wls Str face
V41	36	#3	2-9	" " " "
V42	3	#4	9-0	Wls - Fill face
V43	24	"	9-3	" - Fill & Str face
V44	9	"	15-6	" - Fill face
V45	9	#3	15-6	" - Str face
V46	3	"	8-6	" " "
V47	14	"	11-9	Wing Wls Both faces
V48	12	"	7-0	Cutoff wls " "
V49	2	"	3-8	" " "
V50	3	"	9-0	Wls Str face
D9	26	#4	4-6	Cutoff & [illegible]
H44	6	#3	8-3	Cutoff wall
H33	3	#4	[illegible]	Side wls - Str face
H34	6	"	7-3	" " "
H35	10	"	18-0	" " [illegible]
H36	[illegible]		12-3	Wing wls - Str face
H37	3	#3	[illegible]	Side " "
H38	6	"	17-3	" "
H39	[illegible]	"	11-9	" "
H40	6	"	[illegible]	Wing wls
H41	12	#4	3-6	" "
H42	4	"	[illegible]	Top of wls [illegible] faces
H43	4	"	6-3	Top of side wls Both faces
U2	6	#3	3-3	Floor & [illegible]
U3	24		4-0	" [illegible]
U4	26		4-0	" [illegible]
T2	4	#4	13-4	Top - Wing wls

Mark	No	Size	Length	Location
		SECTIONS No 2-3 & 4		
F30	39	#3	16-4	Bottom of Floor
F31	72	"	16-5	" " "
F32	90	#4	16-6	Top of Floor
F33	108	#3	17-0	" " "
F34	48	#4	3-0	" " " & Joint
F35	18	"	17-0	Slab at Joint
F36	13	"	5-0	Slab & Cutoff Sec ②
F37	26	"	4-9	" " " ③ & ④
F38	9	#3	23-9	Cutoff wall
F39	10	"	5-9	" "
V30	186	#3	6-8	Slab & Wall
V31	186	"	4-9	" " "
V32	8	"	5-9	Wall @ Corner Sec ②
V33	18	"	9-6	Cutoff wall " "
V34	4	"	3-8	Wall @ Corner " ③ & ④
V35	24	"	7-0	Cutoff wall " " "
V36	18	"	2-9	Wall Curve " ②
H30	78	#3	16-3	Walls
H31	20	"	8-0	Cutoff walls
H32	4	"	7-6	Wall Curve Sec ①
		SECTION No 1		
F19	16	#4	15-6	Floor - Bott
F20	18	#3	21-8	" " "
F21	19	#4	11-0	" - Top
F22	26	"	18-9	" "
F23	53	#6	17-0	" " "
F24	60	"	6-9	" " Cutoff wl
F25	14	#4	22-6	" " "
F26	26	"	7-6	Cutoff wl under Floor
F27	14	"	17-3	Floor Bott
F28	2	"	3-6	" Top
V18	36	#4	6-4	Floor & Wls - Fill face
V19				
V20	46	#5	7-6	" " " " "
V21	36	#3	5-0	" " " Str "
V22	28	"	10-3	Wls Fill face
V23	12	#5	15-6	" "
V24	40	#4	10-3	" Str face
V25	13	#3	15-3	" "
V26	34	#6	11-3	Cutoff wl Far face
V27	32	#3	11-3	" " Near face
H19	6	#4	12-9	Wer wls - Fill face
H20	6	"	11-0	" " - Str face
H21	28	"	15-9	Wls Both faces
H22	4	"	20-0	Top of cutoff wls
H23	4	"	22-6	Cutoff wls
H24	4	"	19-0	Wls - top
H25	16	"	18-9	Wls both faces
H26	6	"	17-0	
H27	14	"	20-9	Cutoff wls - Far face
H28	14	"	22-6	" " - Near face
H29	6	"	9-0	Wer wls
K1	14	#4	3-9	Cutoff and Side wl corner
D4	40	#4	8-4	Fill face side wls & Floor
D5	48	#3	8-6	" " " " "
D6	68	#6	9-3	Cutoff wls - Far face
D7	32	#3	4-9	" " - Near "
S1	28	#7	17-3	Ramp Slab
S2	22	#4	18-9	" "
S3	4	"	[illegible]	Ramp Slab on supports
C1	4	#4	17-3	Curb
C2	28	#3	9-8	"



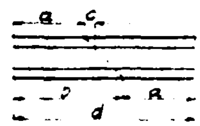


TABLE OF CUTTING DIMENSIONS

Mark	No	a	b	c	d	Remarks
V39	3	3-3	4-8	5	8-6	Cut 3
V42	9	4-	4-11	5	9-0	"
V44	0	3	4-8	48	15-6	Cut 9
V45	9	6-8	9-3	48	15-6	" "
V46	3	3-10	4-8	5	8-6	Cut 3
V47	14	2-0½	9-0½	12	1-4	Cut 2 groups - [illegible]
V50	3	4	4-11	5	9-0	Cut 3
H33	3	5-0	12-6	99	17-6	"
H36	7	2-2	10-9	18	16-0	Cut 7 & Bend as shown
H37	3	5-0	12-6	9-9	17-6	Cut 3
H40	6	2-6	8-9	15	11-3	Cut 6
V29	3	5-2	[illegible]	5	[illegible]	Cut 3
[illegible]	12	5-2½	10-3½	5½	5	Cut 2
H26	6	4-9	12-3	3-4	17-0	Cut 2 groups - 3 bars each

Note: All bars to be cut and bent as indicated, wired into bundles and identified

Mo Conservation Comm.
Spillway - Millersburg Lake
Callaway County

Drawn Aug 1959 - F.C.L.

SHEET 8, APPENDIX A

APPENDIX B

9-277
(Nov. 1960)

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY
WATER RESOURCES DIVISION

File No. { Washington ....
Field 6-9104.3

Description Prepared 11-6-64 (Date)
by E. E. Garn

Description of Gaging Station on Little Dixie Lake at Millersburg, Mo.

(Prepare description in accordance with outline on back of Form 9-277. Plot cross section to scale. Use Form 9-213A or 9-213E for cross section. Use second page of this form for sketch if room is available, otherwise use Form 9-213C or 9-213H. Initial and date all sheets.)

Location.--Lat 38°54'25", long 92°07'30", in SW¼SE¼ sec. 26, T. 48 N., R. 11 W., 500 ft upstream from dam on Owl Creek, 1/2 mile north of Millersburg, 3½ miles upstream from mouth and 13 miles southeast of Columbia, Callaway County.

Established.--August 6, 1964

Drainage Area.-- 3.80 sq mi, from Missouri Conservation Commission.

Gage.--A Stevens A-35 recorder with tipping bucket rain-gage attachment in metal shelter box on 18" corrugated metal pipe well in right bank 500 ft upstream from dam. Length of well is about 14 ft. Top of 3" intake is at elevation 822.36 ft. Length of intake is about 28 ft. Gage is enclosed by 5 ft square metal fence. Add 800.00 ft to tape readings to convert to lake datum.

Bench Marks.--T.B.M. is chiseled square on southwest corner of bridge over spillway. Elevation 838.33 ft.

B.M. 1 is nail in 18" oak tree about 50' northeast of gage. Elevation 833.65 ft.

R.P. 1 in recorder box. Elevation 834.82 ft.

Channel and Control.--Control is manmade earthfill dam with a 24" lake drain near center of dam at elevation 803.0 ft, a 12" feed line to minnow ponds near left end of dam at elevation _____ ft, and an emergency spillway at left end of dam; elevation 831.14 ft ; width 16 ft.

Discharge Measurements.--Low stage measurements may be made below the dam in spillway flume or channel below minnow ponds if there is flow through them. Measure each visit if there is flow from lake.

Point of Zero Flow.-- MAKE MEASUREMENT @ County Road culvert below dam each visit.

Regulations.--Subject to regulation by operation of lake drains.

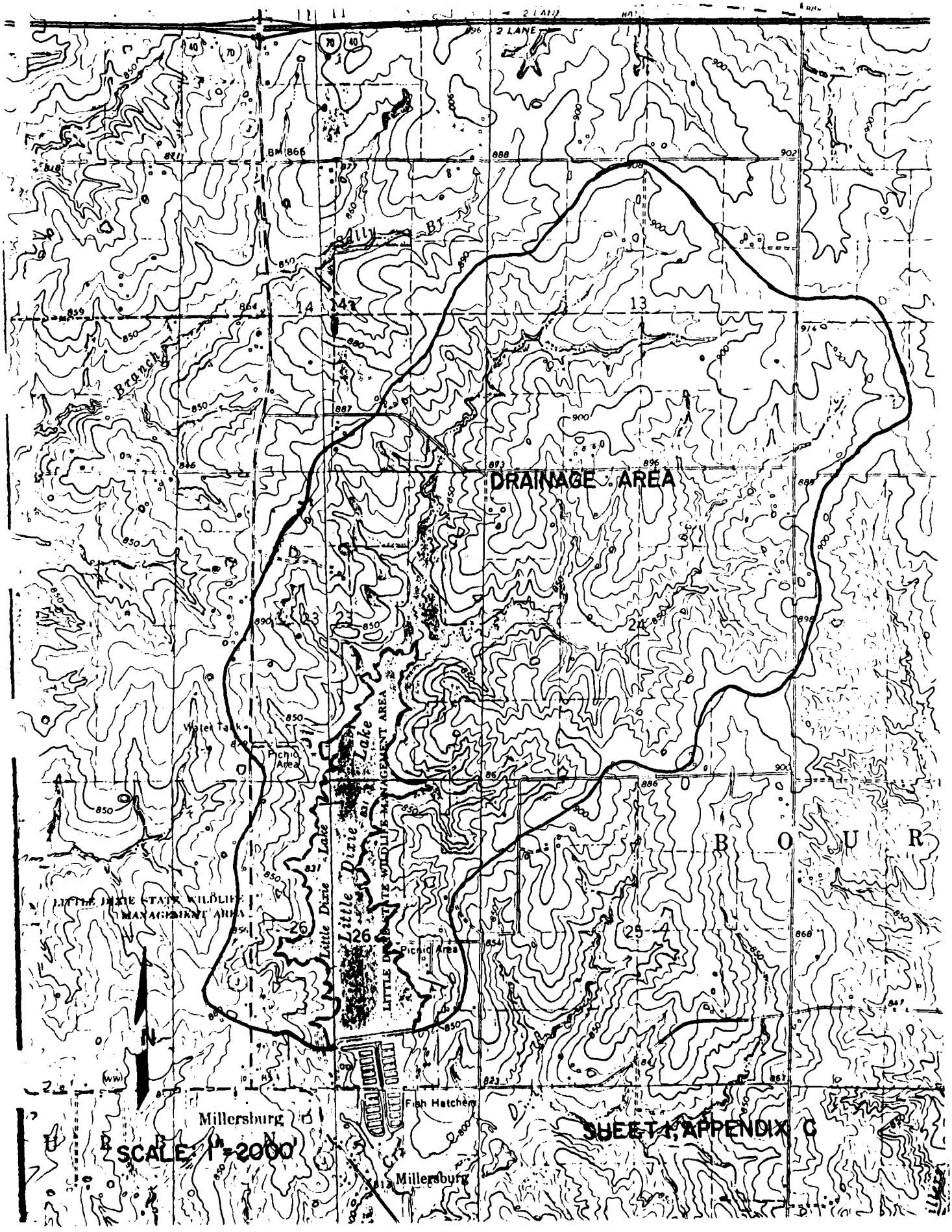
Diversion.--None

Accuracy.--Results should be good.

Cooperation.--Missouri Conservation Commission.

SHEET 1, APPENDIX B

APPENDIX C


DRAINAGE AREA
Little Dixie Lake
Picnic Area
Fish Hatchery
Millersburg
SCALE: 1" = 2000'
SHEET 1, APPENDIX C

HYDRAULIC AND HYDROLOGIC DATA

DESIGN DATA: From Construction Plans

EXPERIENCE DATA: Records available U.S. Geological Survey Gage - A Stevens A-35 Recorder with tipping bucket rain-gage attachment in metal shelter box on 18" corrugated metal pipe well in right bank 500 ft upstream from dam:

Drainage Area 3.8 sq. miles.

Established August 6, 1964

Datum 0 = 800 ft

High Water March 6, 1973 832.33 ft (1.33 ft above Primary Spillway Crest).

For Additional Data See Sheet 1, Appendix B.

VISUAL INSPECTION: At the time of inspection, the pool was about 0.42 ft below the primary spillway crest (Elev. 831.0) due to evaporation.

OVERTOPPING POTENTIAL: Flood routings were performed to determine the overtopping potential. Since the dam is of intermediate size with a high hazard rating, a Spillway Design Storm of 100 percent of the PMF was prescribed by the guidelines. Reservoir area and storage data and the watershed drainage data were obtained from the As-Built plans. A 5-minute interval unit graph was developed for this watershed area which resulted in a peak inflow of 2149 c.f.s. and a time to peak of 50 minutes. Application of the probable maximum precipitation minus losses resulted in a flood hydrograph peak inflow of 21,035 c.f.s. (see Sheet 5 of 6). Rainfall distribution for the 24 hour storm was according to EM 1110-2-1411. Considering all factors, the combination of dam, spillway and storage is not sufficient to pass the PMF without overtopping. The embankment crest (El. 836.3) would be overtopped by 1.99 ft at flood pool elevation 838.29.

Fifty percent of the PMF was routed through the spillways. The resultant maximum pool elevation was 837.02, 0.72 ft above the low elevation of the dam (836.3 ft). The peak outflow was 8295 c.f.s. The portion of the PMF that will just reach the top of the dam at elevation 836.3 ft is about 36 percent. Inspection of the data indicates that 36 percent of the PMF relates to approximately 10.5 in. of watershed runoff. Since the 24 hour 100-year flood consists of 7.5 in. of rainfall for this area, it is obvious that the spillways will pass the 100-year flood without overtopping. For additional data see Summary of Dam Safety Analysis Sheets 3 and 4.

OVERTOPPING ANALYSIS FOR Little Dixie

INPUT PARAMETERS

1. Unit Hydrograph - SCS Dimensionless - Flood Hydrograph Package (HEC-1); Dam Safety Version Was Used.
   Hydraulic Inputs Are As Follows:

   a. Twenty-four Hour Rainfall of 25 Inches
   For 200 Square Miles - All Season Envelope

   b. Drainage Area = 2400 Acres; = 3.75 Sq. Miles

   c. Travel Time of Runoff 1.3 Hrs.; Lag Time 0.80 Hrs.

   d. Soil Conservation Service Runoff Curve No. 80 (AMC III)
   Soil Group - C

   e. Proportion of Drainage Basin Impervious 0.08

2. Spillways

   a. Primary Spillway: Vertical Drop Weir (Crest El. 831.0)

   Length 34 ft; Side Slopes Vertical; C = 3.53

   b. Emergency Spillway: Trapezoidal Cut Seeded (Crest El. 833.5)

   Length 100 Ft.; Side Slopes 3:1 ; C = 2.65

   c. Dam Overflow (Elev. 836.3 ft)

   Length 1600 Ft.; Side Slopes Vertical; C = 3.0

   Note: Combined Spillways and Dam Rating Curve Data Prepared by Hanson Engineers. Provided to Computer on Y4 and Y5 Cards.

SUMMARY OF DAM SAFETY ANALYSIS

1. Unit Hydrograph

   a. Peak - 2149 c.f.s.

   b. Time to Peak 50 Min.

2. Flood Routings Were Computed by the Modified Puls Method

   a. Peak Inflow (see Sheet 6)

   50% PMF 10,517 c.f.s.; 100% PMF 21,035 c.f.s.

b. Peak Elevation

50% PMF 837.02 100% PMF 838.29

c. Portion of PMF That Will Reach Top of Dam

36 %; Top of Dam Elev. 836.30 Ft.

3. Computer Input and Output Data Sheets 5 and 6

```
LITTLE DIXIE DAM
1**********
 FLOOD HYDROGRAPH PACKAGE (HEC-1)
 DAM SAFETY VERSION      JULY 1979
   LAST MODIFICATION  3 AUG 79
 **********
     1                A        OVERTOPPING ANALYSIS FOR LITTLE DIXIE DAM (NO.5)
     2                A        CO  CODE:027  CO.NAME: COLLAWAY  STATE ID NO.MO 1
     3                A                HANSON ENGINEERS INC. DAM SAFETY INSPECTI
     4                B     300        0        5        0        0        0        0
     5                B1      5
     6                J       1        8        1
     7                J1    0.2      0.3      0.4      0.5      0.6      0.7      0.8
     8                K       0        1                          0        0        1
     9                K1       INFLOW HYDROGRAPH COMPUTATION
    10                M       1        2     3.75                3.75        1
    11                P       0       25      102      120      130
    12                T                                                          -1
    13                W2    1.3      0.8
    14                X       0       -.1        2
    15                K       1        2                                        1
    16                K1       RESERVOIR ROUTING BY MODIFIED PULS AT DIXIE DAM (
    17                Y                                         1        1
    18                Y1      1                                                  3075
    19                Y4    831      832    833.5      835    836.3      838      840
    20                Y5      0      120      474     1469     2810    15733    42650
    21                $S      0     3075     3283     3500     3734     4173     4502
    22                $E    797      831      832      833      834      836    837.5
    23                $$    831
    24                $D  836.3
    25                K      99
```

```
R LITTLE DIXIE DAM (NO.5)  (HEC-1) DAM SAFETY
COLLAWAY  STATE ID NO.MO 10262  DWR.MO DEPT.CONS
S INC. DAM SAFETY INSPECTION (JOB NO. 03778)
0        0        0        0        0        0        0


5      0.6      0.7      0.8      1.0
         0        0        1
TATION
      3.75        1                          1
0      130
                              -1      -80              0.06


                              1
DIFIED PULS AT DIXIE DAM (PRIMARY AND LOW OUTLET)
1         1
                            3075       -1
5    836.3      838       840       842
9     2810    15733     42650     77942
0     3734     4173      4502      5050     5500
3      834      836     837.5       840      842
```

Sheet 5 Appendix C

LITTLE DIXIE DAM

1

PEAK FLOW AND STORAGE (END OF PERIOD) SUMMARY FOR MULTIPLE
FLOWS IN CUBIC FEET PER SECOND (CUBIC
AREA IN SQUARE MILES (SQUARE KI

OPERATION	STATION	AREA	PLAN	RATIO 1	RATIO 2	RATIOS APP RATIO 3
				0.20	0.30	0.40
HYDROGRAPH AT	1	3.75	1	4207.	6310.	8414.
		(9.71)		(119.13)(	178.69)(	238.26)(
ROUTED TO	2	3.75	1	1246.	2428.	5257.
		(9.71)		(35.28)(	68.74)(	148.86)(

1 SUMMARY OF DAM SAFET

PLAN 1 .....

	INITIAL VALUE	SPILLWA
ELEVATION	831.00	83
STORAGE	3075.	3
OUTFLOW	0.	

RATIO OF PMF	MAXIMUM RESERVOIR W.S.ELEV	MAXIMUN DEPTH OVER DAM	MAXIMUM STORAGE AC-FT	MAXIM OUTFL CFS
0.20	834.66	0.00	3880.	124
0.30	835.93	0.00	4157.	242
0.40	836.62	0.32	4309.	525
0.50	837.02	0.72	4397.	829
0.60	837.35	1.05	4470.	1080
0.70	837.64	1.34	4533.	1299
0.80	837.90	1.60	4589.	1496
1.00	838.29	1.99	4674.	1958

********** ********** **********

UMMARY FOR MULTIPLE PLAN-RATIO.ECONOMIC COMPUTATIONS
PER SECOND (CUBIC METERS PER SECOND)
RE MILES (SQUARE KILOMETERS)

RATIOS APPLIED TO FLOWS						
ATIO 2	RATIO 3	RATIO 4	RATIO 5	RATIO 6	RATIO 7	RATIO 8
0.30	0.40	0.50	0.60	0.70	0.80	1.00
6310.	8414.	10517.	12621.	14724.	16828.	21035
178.69)(	238.26)(	297.82)(	357.38)(	416.95)(	476.51)(	595.64)
2428.	5257.	8295.	10808.	12997.	14962	19581
68.74)(	148.86)(	234.88)(	306.04)(	368.02)(	423.67)(	554.46)

UMMARY OF DAM SAFETY ANALYSIS

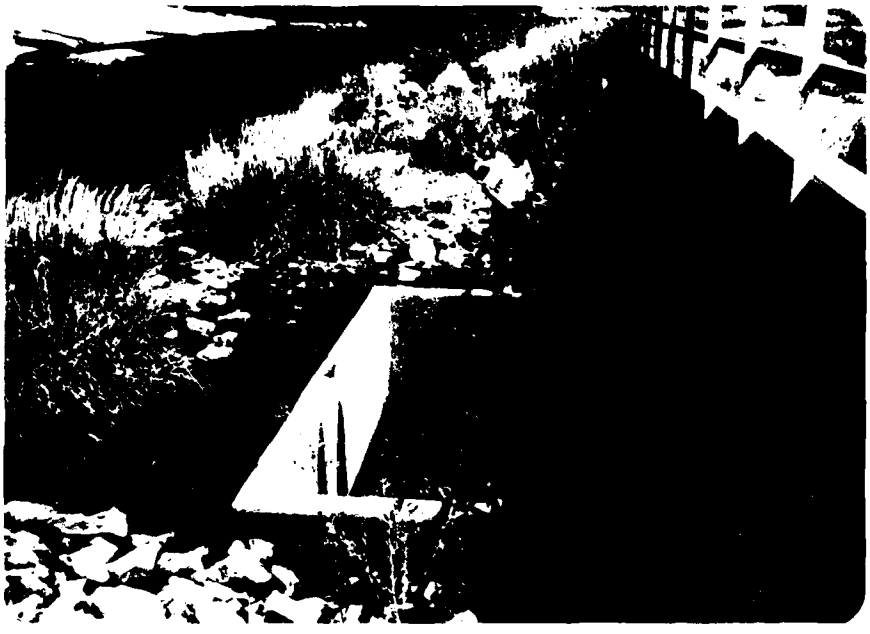
L VALUE	SPILLWAY CREST	TOP OF DAM
1.00	831.00	836.30
D75.	3075.	4239.
0.	0.	2810.

MAXIMUM STORAGE AC-FT	MAXIMUM OUTFLOW CFS	DURATION OVER TOP HOURS	TIME OF MAX OUTFLOW HOURS	TIME OF FAILURE HOURS
3880.	1246.	0.00	18.58	0.00
4157.	2428.	0.00	18.08	0.00
4309.	5257.	2.08	17.08	0.00
4397.	8295.	2.75	16.83	0.00
4470.	10808.	3.17	16.75	0.00
4533.	12997.	3.67	16.67	0.00
4589.	14962.	4.17	16.67	0.00
4674.	19581	5.08	16.58	0.00

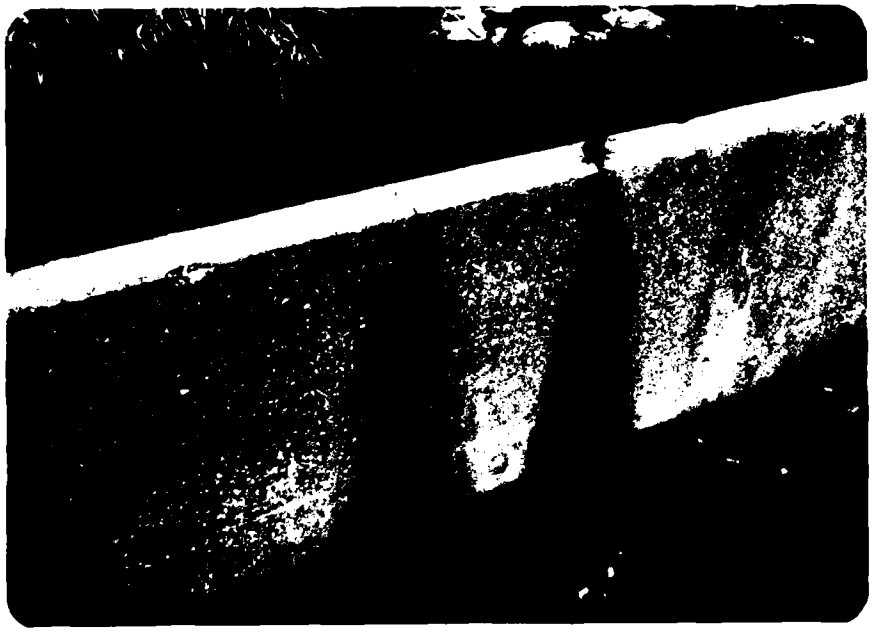
2

1 2

APPENDIX D



Primary Spillway Inlet Structure

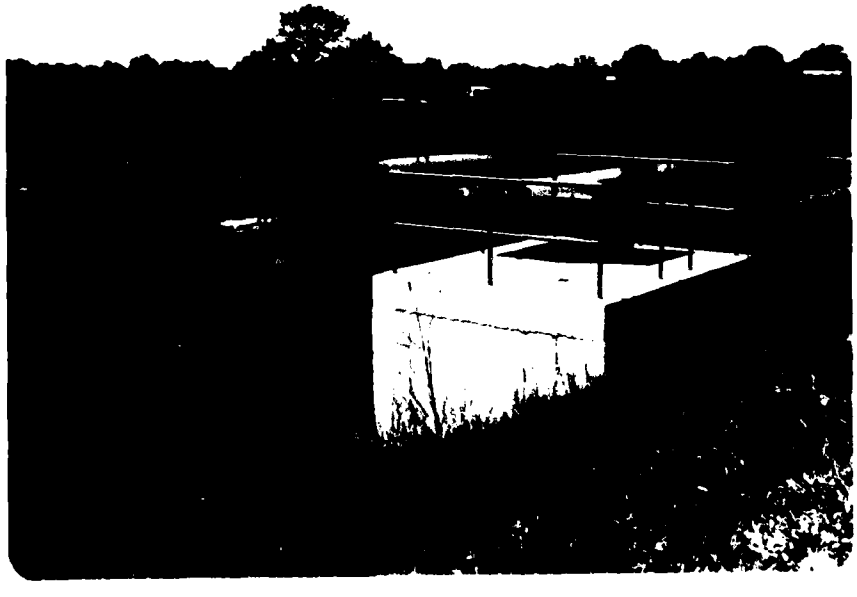


Cracking in Primary Inlet Weir Walls

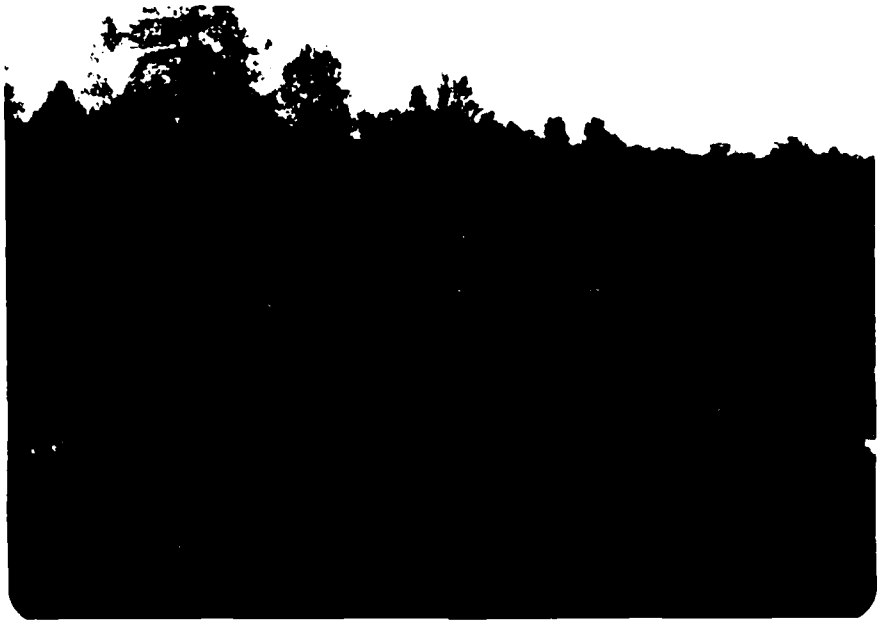
Concrete Chute Spillway

Outlet Channel - Looking Upstream

Crest of Dam - Looking West

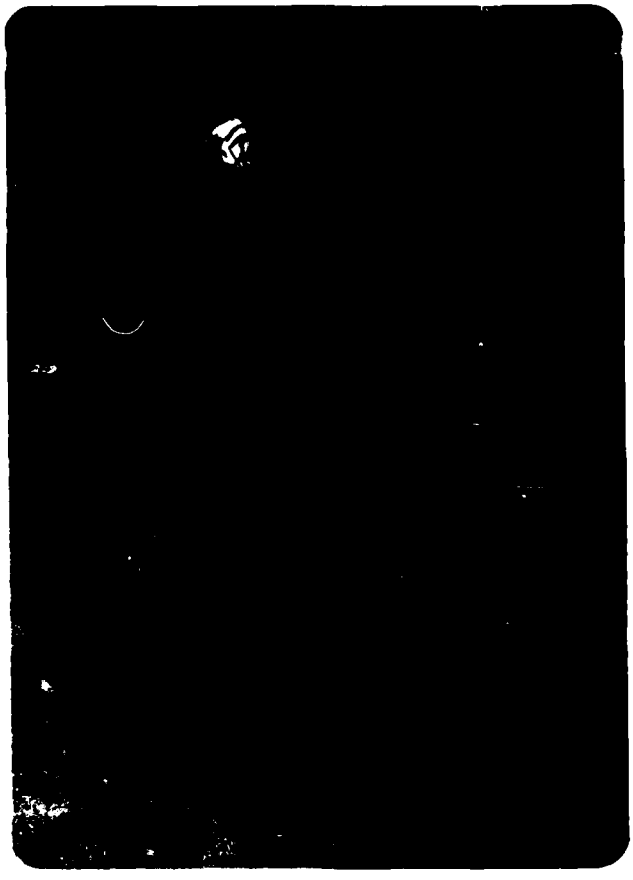


Rearing Pool Feed Line Gate Valve

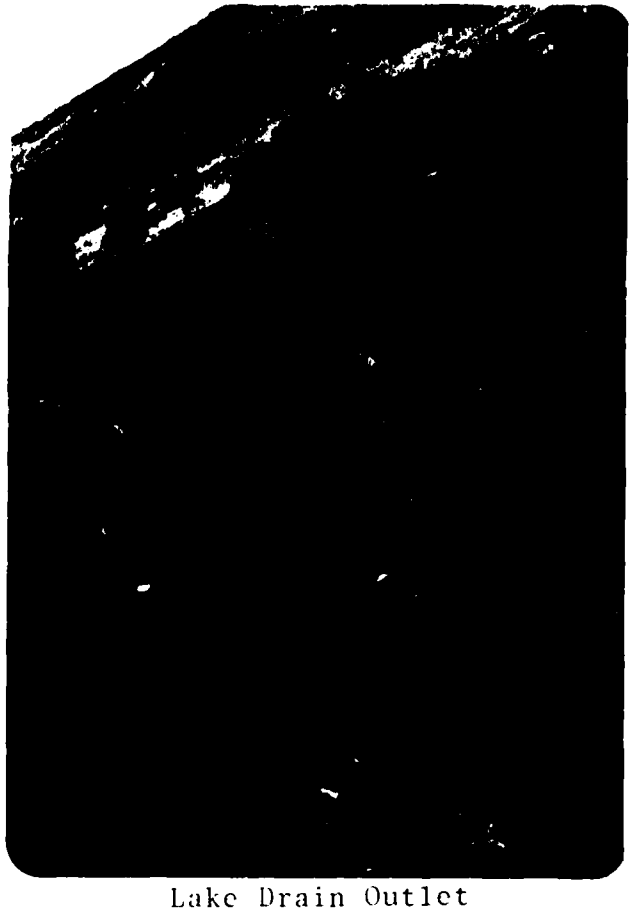


Emergency Spillway - Looking Downstream

Emergency Spillway - Looking Upstream



Cracking of Concrete Bridge



Lake Drain Outlet

Fish Rearing Ponds - Looking Downstream